

“Plastics... were used in furniture, clothing, containers, appliances, just about everything. Sometimes the poisons leached into food or water and caused cancer, and sometimes there was a fire and plastics burned and gassed people to death... The only place that has enough of it to be a real danger is right here.”

– Octavia E. Butler, *Adulthood Rites*, 1988

Beneath and Above the Horizon

Proposal for Second Floor of Kunsthalle Basel, June 2020

Liz Larner October 2019

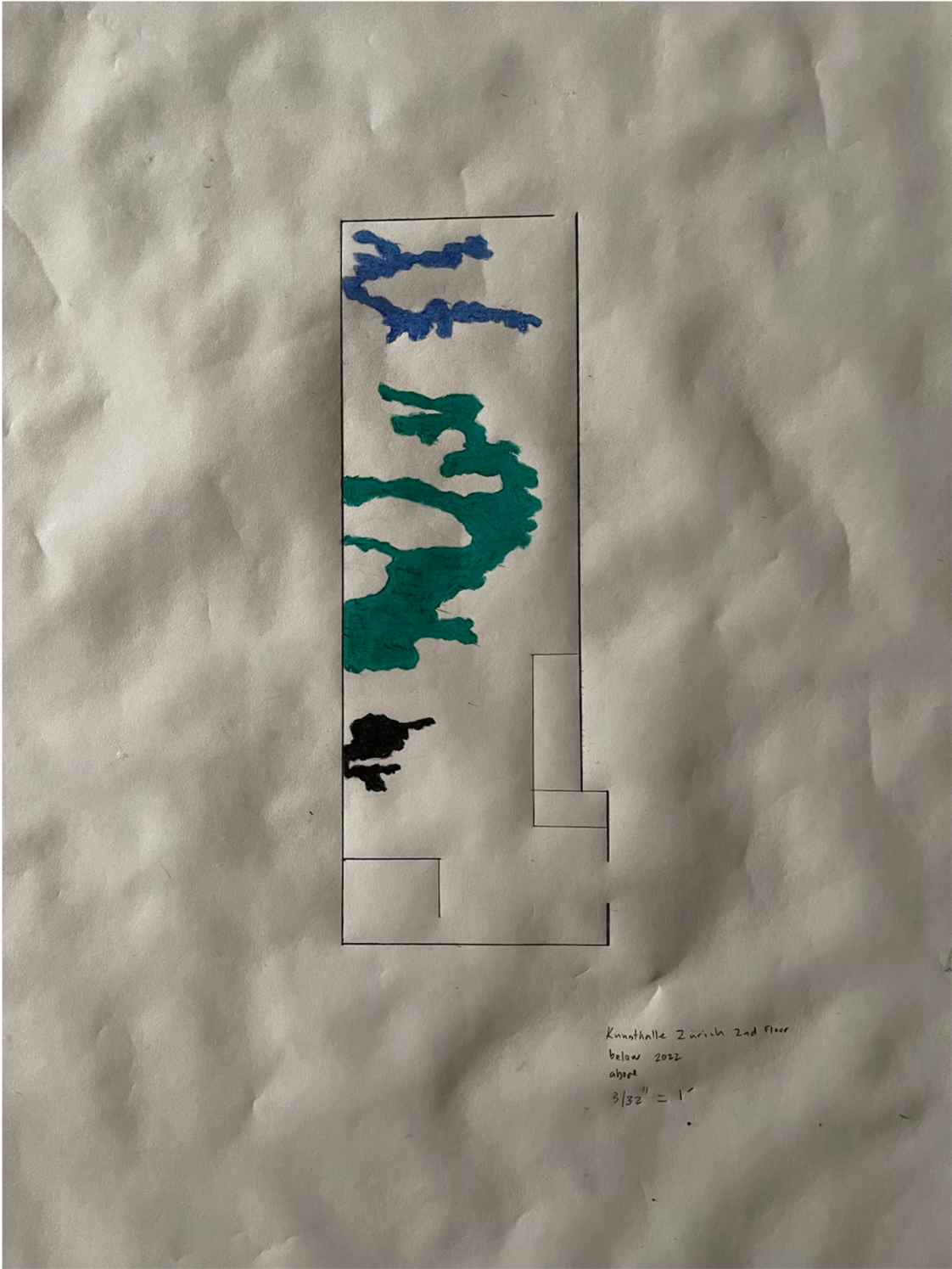
Beneath and Above the Horizon is an installation of low forms based on the undulating, tessellating forms of seafoam drifts. These plastic froth drifts will be interspersed with glazed ceramic forms based on *2019 OK*, a type of asteroid nicknamed by astronomers as "city-killers." If this type of asteroid were to collide with the earth, it would be the equivalent of 10 megatons of TNT. *2019 OK* was an undetected asteroid that came very close to crashing to Earth on July 25, 2019. In an interview with the *Washington Post*, Melbourne-based observational astronomer Michael Brown noted, "People are only sort of realizing what happened pretty much after it's already flung past us."

This paragraph represents the working title and premise for the installation I am proposing for the 2nd Floor of Kunsthalle Zurich for June 2020.

Somehow, I would like to introduce the word Meerschaum into the title for the plastic pieces. It is one of those wonderful words that has multiple meanings. I believe I am correct in saying that it simply translates to "seafoam" in German, but it also refers to a mineral Sepiolite, that in its raw form has a texture much like seafoam. Sepiolite is much valued for making Meerschaum pipes.

This PDF will serve as a sketch model for the idea rather than an exact representation. The scale cannot be accurately pictured, as the sea foam pieces in the pattern will be much larger, but I hope you get my drift.

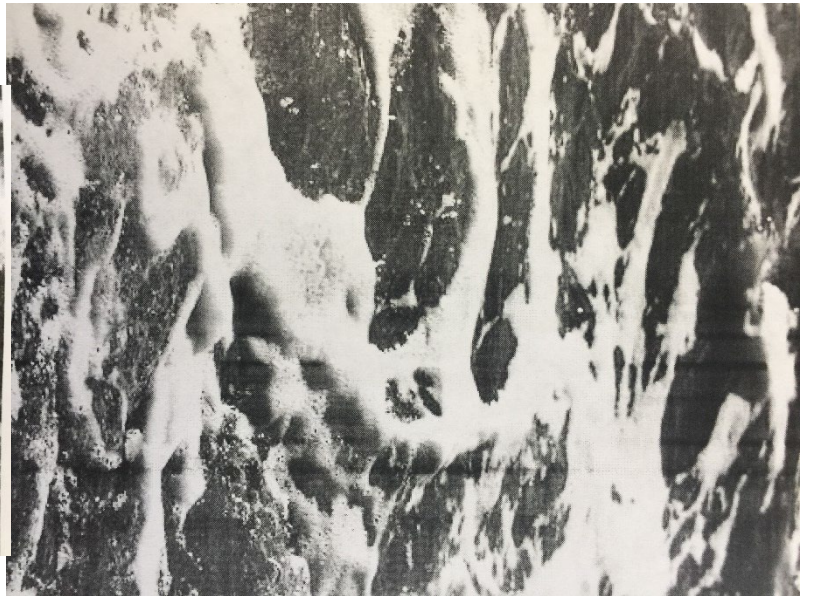
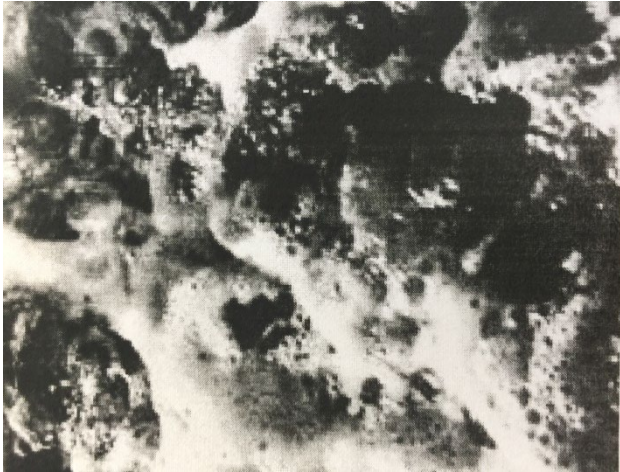
These works will breakdown into layers and segments for shipping and be reassembled on site.



Kunsthalle Zurich, Second Floor



Raw Sepiolite





The Meerscham forms will be made of used plastic, much of it unrecyclable. These are plastics, and plastics that are combined with metals or paper for food containers and other uses like toys and wrappers and other non-

recyclable plastic products. Some of this will be altered and reformed by heat or cutting, and painted and glued, pinned or tied together with other plastic objects like pens, twist ties, and zip ties.



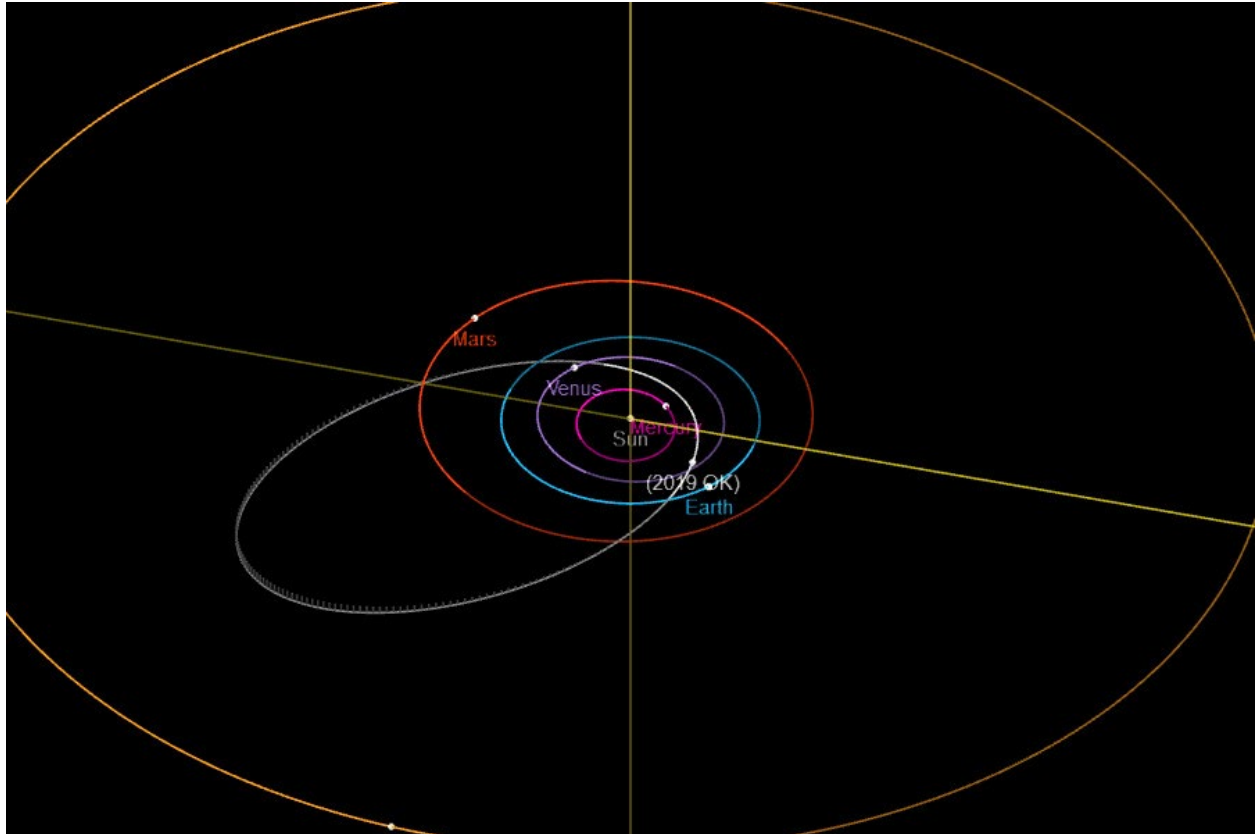




“...depiction of an asteroid in space. NASA confirmed that on July 25, Asteroid 2019 OK passed about 73,000 kilometers from Earth, roughly one-fifth the distance to the moon.”

<https://www.washingtonpost.com/nation/2019/07/26/it-snuck-up-us-city-killer-asteroid-just-missed-earth-scientists-almost-didnt-detect-it-time/>

The *City Killer 2019 OK* sculptures will be in some ways like the *Animal Vegetable* sculptures in my last show at Regen Projects, in that they will be variations on a form in various sizes. The image of *2019 OK* used in the Washington Post article is a depiction of an undated asteroid in space that is itself a guess at what *2019 OK* may have looked like. These forms in various sizes will be interspersed throughout the plastic Meerscham forms, with the larger ones being closer to the entrance and the smaller toward the back wall. Visitors to the Kunsthalle will be able to wander through the sea of plastic in the open areas between the seafoam drifts and asteroid sculptures.



Jumbo Jet-Sized Asteroid's Closer Than Moon Flyby in Orbit Animation

Please watch the video, it's stunning.

<https://www.youtube.com/watch?v=IBB6DEAY0zw>

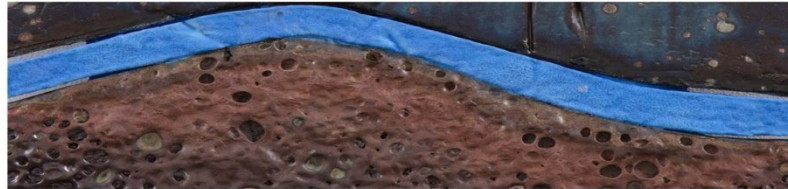


Meershaum form with *City*



Killer sculpture

Glaze Reference



Horizon lines.

The walls will be painted with a low horizon line on the back wall and a high horizon line on the side wall opposite the windows.

PLASTIC RESIN CODES



PETE

Polyethylene Terephthalate
soda bottles
water bottles
shampoo bottles
mouthwash bottles
peanut butter jars



HDPE

High Density Polyethylene
milk, water and juice jugs
detergent bottles
yogurt and margarine tubs
grocery bags



V

Vinyl
clear food packaging
shampoo bottles



LDPE

Low Density Polyethylene
bread bags
frozen food bags
squeezable bottles (mustard, honey)



PP

Polypropylene
ketchup bottles
yogurt and margarine tubs








PS





Polystyrene
meat trays
egg cartons
cups and plates










OTHER

Other
ketchup
3 & 5 gallon water bottles
some juice bottles

| Type of Plastic | Uses | Melting Temp | Glue/Bonding | Paint | Notes |
|--|---|---|--|-------|--|
| PETE Polyethylene Terephthalate  | soda bottles, water bottles, shampoo bottles, mouthwash bottles, peanut butter jars, salad dressing bottles, microwaveable packaging | 260°C 500°F | 3M DP8005 3M DP8010 Or Primer AC77+PR600 /SF100 | | |
| HDPE High Density Polyethylene  | milk, water, and juice jugs, detergent bottles, yogurt and margarine tubs, grocery bags, shampoo, lotion and deodorant bottles, motor oil bottles, | 115–135 °C 239–275 °F Depending on kind of polyethylene | 3M DP8005 3M DP8010 Or 3M Primer AC77 + PR600 /SF100 | | |
| PVC Polyvinyl Chloride  | cooking oil bottles, clear food packaging, window cleaner bottles, shampoo bottles | 100°C to 260°C 212°F to 500°F Depending upon manufacture additives to the PVC | 3M DP807, DP810, DP812,DP825,DP8010 2216 B/A, DP100 Plus, DP125, DP420, DP460, DP8405 3M CA40H, CA100, PR600,SF100 | |  Do not burn or melt PVC; gives off very harmful gases when it degrades |
| LDPE Low Density Polyethylene  | bread bags, frozen food bags, squeezable bottles, clamshell packaging or frozen food, bread bags, shrink wrap + stretch film, bubble wrap, Ziploc bags. | 115–135 °C 239–275 °F Depending on kind of polyethylene | 3M DP8005 3M DP8010 Or 3M Primer AC77 + PR600 /SF100 | | |

| Type of Plastic | Uses | Melting Temp | Glue/Bonding | Paint | Notes |
|--|--|--------------------------------|--|-------|---|
| PP Polypropylene  | ketchup bottles, yogurt and margarine tubs, health & beauty lotion containers | 130 to 171 °C 266 to 340 °F | 3M DP8005 3M DP8010 Or Primer AC77+PR600 /SF100 | | |
| PS Polystyrene  | carryout food containers, disposable cups and plates, aspirin bottles, egg cartons, meat trays | 210-249 °C 410 -480 °F | 3M DP807, DP810, DP812,DP825,DP8010 3M 2216 B/A, DP100 Plus, DP125, DP420, DP460, DP8405 3M CA40H, CA100, PR600,SF100 | | |
| OTHER Including acrylic, polycarbonate, polyactic fibers, nylon, fiberglass  | Ketchup, 3 and 5 gallon waters bottles, some juice bottles, DVD's, Computer cases | | 3M DP807, DP810, DP812,DP825,DP8010 2216 B/A, DP100 Plus, DP125, DP420, DP460, DP8405 CA4OH, CA100, PR600,SF100 | |  Do not burn or melt acrylic or polycarbonate; gives off very harmful gases when it degrades |

| Type of Plastic | Float / Sink | Tear/Stretch | Transparency | Burn Test |
|---|--------------|---|--|--|
| PETE Polyethylene Terephthalate  | Sinks | | | Yellow flame, plastic drips, burns slowly, light smoke. |
| HDPE High Density Polyethylene  | Floats | Fairly stiff and hard, can be scratched by fingernail Easily cut with smooth edges | Transparent only as thin film, translucent in thicker sections | Not self-extinguishing; molten droplets which usually go out on reaching bench or floor; blue flame with yellow tip and little smoke, smell of burning candle/paraffin when the flame is extinguished. Burns slowly. |
| PVC Polyvinyl Chloride  | Sinks | Stiff; hard Fairly easy to cut, smooth edges | Transparent (unless fillers or pigments have been added) | Burns with difficulty, self-extinguishing; yellow flame, blue-green at bottom edges; unpleasant, acrid odour of hydrochloric acid. Plastic does not drip, plastic chars |
| LDPE Low Density Polyethylene  | Floats | Fairly flexible; soft, 'waxy' feel, easily scratched Easily and smoothly cut | Transparent only as thin film, translucent in thicker sections | Not self-extinguishing; molten droplets which usually go out on reaching bench or floor; blue flame with yellow tip and little smoke, smell of burning candle/paraffin when flame is extinguished. |

| Type of Plastic | Float / Sink | Tear/Stretch | Transparency | Burn Test |
|---|--------------|--|--|---|
| <p>PP Polypropylene</p>  | Floats | Stiff; hard, can be scratched by fingernail Easily cut, fairly smooth edges, when cut with chisel leaves white mark | Transparent only as thin film, translucent in thicker sections | Not self-extinguishing; molten droplets which usually go out on reaching bench or floor; flame mainly yellow with a trace of clear blue at the bottom; smell of burning candle/diesel when flame is extinguished. Has sweet odor. |
| <p>PS Polystyrene</p>  | Floats | | | |
| <p>OTHER Including acrylic, polycarbonate, polyactic fibers, nylon, fiberglass</p>  | | | | Polycarbonate: orange flame, self-extinguishing, plastic drips, black smoke with soot floating particles, faint sweet aromatic odor |

Types of Plastic and Bonding Agents

1 PETE, Polyethylene Terephthalate

2 HDPE, High density Polyethylene

3 PVC, Polyvinyl Chloride

4 LDPE Low-density, Polyethylene

5 PP, Polypropylene

6 PS, Polystyrene (Styrofoam)

7 Other

Loctite Plastics Bonding System

The activator primes hard-to-bond surfaces such as polypropylene and polyethylene. Loctite® Super Glue Plastics Bonding System dries clear and sets without clamping. It is resistant to water, most chemicals and freezing temperatures. (From their website)

Scotch Weld DP 8010

Creates strong bond on low surface energy plastics (LSE) such as polyolefin with minimal or no surface prep required

Resists many chemicals, water, humidity and corrosion

Formulated to bond multi-material assemblies such as **LSE plastics*****, thermoplastics, composites and metals

Medium viscosity allows controlled dispensing

10 minute work life with 60 minute handling strength

Strong adhesive can replace screws, rivets and welding

3M™ Scotch-Weld™ Structural Plastic Adhesive DP8010 Blue is a two-part acrylic adhesive specially formulated to bond many low surface energy plastics, including many grades of polypropylene, polyethylene, and thermoplastic elastomers (TPEs) without special surface preparation.

***The most used LSE plastics are:

- **Polymethyl methacrylate (PMMA)** – widely known as plexiglass. It is used in applications similar to these of the glass. But PMMA is preferred in many industries because of its good price, easier processing, efficiency and visible light transmission. It is widely spread in secondary industry, interior decorations and advertising;

- **Polypropylene (PP)** – It is used for bottles caps, drinking straws, yogurt pots, kitchen appliance parts, car parts (bumpers), plastic piping systems;
- **Polyethylene(PE)** – from this plastic are produced shopping bags, garbage bins and more than 30% of the kids toys worldwide;
- **Polystyrene, known as styrofoam** – widely used in construction, for thermal insulation. Kids building blocks, plastic utensils, food packs are made of polystyrene too.
- **EVA (porous rubber)** – it is a foam polyethylene. For producing of yoga mats, kids toys, fishing equipment, EVA clogs and anatomic insoles; in construction sector – for different types of insulation;
- **Polycarbonate (PC)** – used for CDs, sunglasses, police shields, “armored” windows;
- **ABS (acrylonitrile butadiene styrene)** – a thermoplastic used for panels for electronics (monitors, printers, keyboards), pipes, LEGO blocks.

The most used HSE plastics (easy to bond) are:

PVC (extremely soft), cast plastics, ABS mixtured with PC, rubber, EPDM, HDPE, PET/PETG, polyamide, TPOs, powder-coated surfaces.

- **ABS mixtures with polycarboate** – for producing car interior parts, panels for mobile phones.
- **HDPE (polyethylene with high density)** – for manufacturing bottles of liquid cleaners, milk packs and others.
- **PVC (Polyvinyl chloride)** – for the production of sewer pipes and gutters, bathroom curtains, window frames, floorings and even gramophone plates. Most of the bathroom furniture is made of PVC.
- **PET/PETG (Polyethylene terephthalate)** – a part of polyesters group. About 60% of the world’s production of this polymer is used to make yarn from which are made clothes, sails, and many others.
- **EPDM (synthetic rubber)** – it is used to manufacture rubber membranes for hydro insulation, car rubber sealings, garden hoses, cable insulation and more;
- **TPOs (thermoplastic polyolefin)** – is a combination of polypropylene and ethylene propylene rubber. It is used fro producing multilayer thermally films for packaging of food products.
- **Полиамид (Nylon)** – for manufacturing of sliding bearings and strips, bushings, gears, nuts and bolts and more for automotive and machine industries; in textile industry to replace the silk in clothes producing.

More info:

<https://www.zalepi.bg/en/what-are-lse-and-hse-plastics/>

Primer for LSE Surfaces

3M Primer 94 – a liquid base for bonding self-adhesive films

For Bonding HSE Plastics:

3M™ Scotch-Weld™ Acrylic Adhesive DP807

3M™ Scotch-Weld™ Low Odor Acrylic Adhesive DP810

M™ Scotch-Weld™ Acrylic Adhesive DP812NS

3M Scotch-Weld Acrylic Adhesive DP825 Off-White

Plastic Welders

| | |
|--|------|
| 800 Watt Plastic Welding Kit with Adjustable Temperature –Needs air compressor | \$55 |
| 1300 Watt Plastic Welding Kit with Air Motor and Temperature Adjustment 96712 | \$70 |

https://www.3m.com/3M/en_US/bonding-and-assembly-us/structural-adhesives/

<https://envirocare.org/plastic-fume-monitoring-exposure/>

The plastic materials themselves are not an issue and from an occupational hygiene point of view, would need to be controlled at the nuisance dust level of 10mg/m³. The main point of concern regarding work in 'plastic environments' is exposure to by-products released during the manufacturing / processing of plastics. The most notable of scenario's being fumes released during heat treatment of plastics. By-products include , but are not limited to, the following:

| Plastic | Constituents in fume | Common Uses |
|---------------------------------|---------------------------------|-----------------------------------|
| Acetals | Formaldehyde | Plastic Zippers, aerosol cans |
| Acrylonitrile Butadiene Styrene | Styrene, phenol, butadiene | Lego bricks, automotive trims |
| Polyethylene (low density) | Butane, other alkanes, alkenes | Packaging |
| PET Polyethylene Terephthalate | PAHs, styrene, aldehydes | Plastic bottles |
| Polypropylene | Formaldehyde, acrolein, acetone | Plastic hinges, plastic furniture |
| Polystyrene | Styrene, aldehydes | CD Cases, disposable razors |
| PVC Polyvinyl Chloride | Hydrogen chloride | Pipework, double glazing |

Plastic Fume Health Hazards

When plastic pellets, granules and powders are heated through processing, plastic fume can be produced which include respiratory sensitisers, irritants and carcinogens being released into the working environment. Immediate effects of these may include severe irritation to the nose, lungs and eyes. In some cases, especially during prolonged exposures, the effects can be long term and irreversible.

Toxic gases emitted by burning plastic materials like dioxins and furans may also cause cancer, impotence, asthma and a myriad of other detrimental effects to human beings.

When carrying out a survey, testing would be conducted for the byproducts rather than generic plastic fume. The production of plastic fume is affected by the material and the conditions under which the material is being processed, the maintenance level of the machine and the level of control of temperature.

“...preventing or reducing exposure to hazardous substances by improving safety measures (protective equipment, PPE) and [Control Strategies](#), such as local exhaust ventilation, can be implemented.”

Material Melt & Mold Temperatures

<https://www.plastikcity.com/knowledge-base/industry-calculators/material-melt-mold-temperatures>

PVC (poly vinyl chloride,**don't melt this one,its toxic**) melts at about 160 degrees C.

HDPE (High Density Poly Ethelene) 120–180 C

MDPE (Medium Density Poly Ethelene) 120–180 C

LDPE (Low Density Poly Ethelene) 105–115 C

PET(E) (polyethylene terephthalate, **dont melt toxic**) 250–250 C

PP (poly Propylene VARYIES) 130?, 160?, 170? C

PS (poly Styrene, **dont melt, toxic**) 240 C

PLA (Poly Lactic Acid, biodegradable plant plastic) 173–178 C

<https://www.quora.com/How-do-the-melting-points-of-different-types-of-plastic-vary>

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<https://www.alro.com/divgeneral/requestplasticstds.aspx>

Technical Data:

https://www.tapplastics.com/product_info/data_sheets

Plastics

Plastics are made by condensation polymerization (polycondensation) or addition polymerization (polyaddition) of monomer units. In polycondensation, the polymer chain grows by condensation reactions between molecules and is accompanied by formation of low molecular weight byproducts such as water and methanol.

Polycondensation involves monomers with at least 2 functional groups such as alcohol, amine, or carboxylic groups. In polyaddition, polymer chains grow by addition reactions, in which 2 or more molecules combine to form a larger molecule without liberation of by-products. Polyaddition involves unsaturated monomers; double or triple bonds are broken to link monomer chains. There are several advantages to using plastics for food packaging. Fluid and moldable, plastics can be made into sheets, shapes, and structures, offering considerable design flexibility. Because they are chemically resistant, plastics are inexpensive and lightweight with a wide range of physical and optical properties. In fact, many plastics are heat sealable, easy to print, and can be integrated into production processes where the package is formed, filled, and sealed in the same production line. The major disadvantage of plastics is their variable permeability to light, gases, vapors, and low molecular weight molecules.

There are 2 major categories of plastics: thermosets and thermoplastics (EPA 2006b). Thermosets are polymers that solidify or set irreversibly when heated and cannot be remolded. Because they are strong and durable, they tend to be used primarily in automobiles and construction applications such as adhesives and coatings, not in food packaging applications. On the other hand, thermoplastics are polymers that soften upon exposure to heat and return to their original condition at room temperature. Because thermoplastics can easily be shaped and molded into various products such as bottles, jugs, and plastic films, they are ideal for food packaging. Moreover, virtually all thermoplastics are recyclable (melted and reused as raw materials for production of new products), although separation poses some practical limitations for certain products. The recycling process requires separation by resin type as identified by the American Plastics Council (Table 1).

[Enlarge this Image](#)

| Resin | Code | Amount generated (thousand tons) | Amount recycled (thousand tons) |
|----------------------------|------|----------------------------------|---------------------------------|
| Polyethylene terephthalate | 1 | 2860 | 540 |
| High-density polyethylene | 2 | 5890 | 520 |
| Polyvinyl chloride | 3 | 1640 | |
| Low-density polyethylene | 4 | 6450 | 190* |
| Polypropylene | 5 | 4000 | 10 |
| Polystyrene | 6 | 2590 | |
| Other resins | 7 | 5480 | 390 |

Source: American Plastics Council (2006b) and EPA (2006a).

*Includes linear low-density polyethylene.

Table 1--- Resin identification codes for plastic recycling

There have been some health concerns regarding residual monomer and components in plastics, including stabilizers, plasticizers, and condensation components such as bisphenol A. Some of these concerns are based on studies using very high intake levels; others have no scientific basis. To ensure public safety, FDA carefully reviews and regulates substances used to make plastics and other packaging materials. Any substance that can reasonably be expected to migrate into food is classified as an indirect food additive subject to FDA regulations. A threshold of regulation—defined as a specific level of dietary exposure that typically induces toxic effects and therefore poses negligible safety concerns (21 CFR §170.39)—may be used to exempt substances used in food contact materials from regulation as food additives. FDA revisits the threshold level if new scientific information raises concerns. Furthermore, FDA advises consumers to use plastics for intended purposes in accordance with the manufacturer's directions to avoid unintentional safety concerns.

Despite these safety concerns, the use of plastics in food packaging has continued to increase due to the low cost of materials and functional advantages (such as thermosealability, microwavability, optical properties, and unlimited sizes and shapes) over traditional materials such as glass and tinplate (Lopez-Rubio and others 2004). Multiple types of plastics are being used as materials for packaging food, including polyolefin, polyester, polyvinyl chloride, polyvinylidene chloride, polystyrene, polyamide, and ethylene vinyl alcohol. Although more than 30 types of plastics have been used as packaging materials (Lau and Wong 2000), polyolefins and polyesters are the most common.

Polyolefins . Polyolefin is a collective term for polyethylene and polypropylene, the 2 most widely used plastics in food packaging, and other less popular olefin polymers. Polyethylene and polypropylene both possess a successful combination of properties, including flexibility, strength, lightness, stability, moisture and chemical resistance, and easy processability, and are well suited for recycling and reuse.

The simplest and most inexpensive plastic made by addition polymerization of ethylene is polyethylene. There are 2 basic categories of polyethylene: high density and low density. High-density polyethylene is stiff, strong, tough, resistant to chemicals and moisture, permeable to gas, easy to process, and easy to form. It is used to make bottles for milk, juice, and water; cereal box liners; margarine tubs; and grocery, trash, and retail bags. Low-density polyethylene is flexible, strong, tough, easy to seal, and resistant to moisture. Because low-density polyethylene is relatively transparent, it is predominately used in film applications and in applications where heat sealing is necessary. Bread and frozen food bags, flexible lids, and squeezable food bottles are examples of low-density polyethylene. Polyethylene bags are sometimes reused (both for grocery and nongrocery retail). Of

the 2 categories of polyethylene, high-density polyethylene containers, especially milk bottles, are the most recycled among plastic packages.

Harder, denser, and more transparent than polyethylene, polypropylene has good resistance to chemicals and is effective at barring water vapor. Its high melting point (160 °C) makes it suitable for applications where thermal resistance is required, such as hot-filled and microwavable packaging. Popular uses include yogurt containers and margarine tubs. When used in combination with an oxygen barrier such as ethylene vinyl alcohol or polyvinylidene chloride, polypropylene provides the strength and moisture barrier for catsup and salad dressing bottles.

Polyesters . Polyethylene terephthalate (PET or PETE), polycarbonate, and polyethylene naphthalate (PEN) are polyesters, which are condensation polymers formed from ester monomers that result from the reaction between carboxylic acid and alcohol. The most commonly used polyester in food packaging is PETE.

Polyethylene terephthalate . Formed when terephthalic acid reacts with ethylene glycol, PETE provides a good barrier to gases (oxygen and carbon dioxide) and moisture. It also has good resistance to heat, mineral oils, solvents, and acids, but not to bases. Consequently, PETE is becoming the packaging material of choice for many food products, particularly beverages and mineral waters. The use of PETE to make plastic bottles for carbonated drinks is increasing steadily (van Willige and others 2002). The main reasons for its popularity are its glass-like transparency, adequate gas barrier for retention of carbonation, light weight, and shatter resistance. The 3 major packaging applications of PETE are containers (bottles, jars, and tubs), semirigid sheets for thermoforming (trays and blisters), and thin-oriented films (bags and snack food wrappers). PETE exists both as an amorphous (transparent) and a semicrystalline (opaque and white) thermoplastic material. Amorphous PETE has better ductility but less stiffness and hardness than semicrystalline PETE, which has good strength, ductility, stiffness, and hardness. Recycled PETE from soda bottles is used as fibers, insulation, and other nonfood packaging applications.

Polycarbonate . Polycarbonate is formed by polymerization of a sodium salt of bisphenol acid with carbonyl dichloride (phosgene). Clear, heat resistant, and durable, it is mainly used as a replacement for glass in items such as large returnable/refillable water bottles and sterilizable baby bottles. Care must be taken when cleaning polycarbonate because using harsh detergents such as sodium hypochlorite is not recommended because they catalyze the release of bisphenol A, a potential health hazard. An extensive literature analysis by vom Saal and Hughes (2005) suggests the need for a new risk assessment for the low-dose effects of this compound.

Polyethylene naphthalate . PEN is a condensation polymer of dimethyl naphthalene dicarboxylate and ethylene glycol. It is a relatively new member of the polyester family with excellent performance because of its high glass transition temperature. PEN's barrier properties for carbon dioxide, oxygen, and water vapor are superior to those of PETE, and PEN provides better performance at high temperatures, allowing hot refills, rewashing, and reuse. However, PEN costs 3 to 4 times more than PETE. Because PEN provides protection against transfer of flavors and odors, it is well suited for manufacturing bottles for beverages such as beer.

Polyvinyl chloride. Polyvinyl chloride (PVC), an addition polymer of vinyl chloride, is heavy, stiff, ductile, and a medium strong, amorphous, transparent material. It has excellent resistance to chemicals (acids and bases), grease, and oil; good flow characteristics; and stable electrical properties. Although PVC is primarily used in medical and other nonfood applications, its food uses include bottles and packaging films. Because it is easily thermoformed, PVC sheets are widely used for blister packs such as those for meat products and unit dose pharmaceutical packaging.

PVC can be transformed into materials with a wide range of flexibility with the addition of plasticizers such as phthalates, adipates, citrates, and phosphates. Phthalates are mainly used in nonfood packaging applications such as cosmetics, toys, and medical devices. Safety concerns have emerged over the use of phthalates in certain products, such as toys (FDA 2002; Shea 2003; European Union 2005). Because of these safety concerns,

phthalates are not used in food packaging materials in the United States (HHS 2005); instead, alternative nonphthalate plasticizers such as adipates are used. For example, di-(2-ethylhexyl) adipate (DEHA) is used in the manufacture of plastic cling wraps. These alternative plasticizers also have the potential to leach into food but at lower levels than phthalates. Low levels of DEHA have shown no toxicity in animals. Finally, PVC is difficult to recycle because it is used for such a variety of products, which makes it difficult to identify and separate. In addition, incineration of PVC presents environmental problems because of its chlorine content.

Polyvinylidene chloride . Polyvinylidene chloride (PVdC) is an addition polymer of vinylidene chloride. It is heat sealable and serves as an excellent barrier to water vapor, gases, and fatty and oily products. It is used in flexible packaging as a monolayer film, a coating, or part of a co-extruded product. Major applications include packaging of poultry, cured meats, cheese, snack foods, tea, coffee, and confectionary. It is also used in hot filling, retorting, low-temperature storage, and modified atmosphere packaging. PVdC contains twice the amount of chlorine as PVC and therefore also presents problems with incineration.

Polystyrene. Polystyrene, an addition polymer of styrene, is clear, hard, and brittle with a relatively low melting point. It can be mono-extruded, co-extruded with other plastics, injection molded, or foamed to produce a range of products. Foaming produces an opaque, rigid, lightweight material with impact protection and thermal insulation properties. Typical applications include protective packaging such as egg cartons, containers, disposable plastic silverware, lids, cups, plates, bottles, and food trays. In expanded form, polystyrene is used for nonfood packaging and cushioning, and it can be recycled or incinerated.

Polyamide . Commonly known as nylon (a brand name for a range of products produced by DuPont), polyamides were originally used in textiles. Formed by a condensation reaction between diamine and diacid, polyamides are polymers in which the repeating units are held together by amide links. Different types of polyamides are characterized by a number that relates to the number of carbons in the originating monomer. For example, nylon-6 has 6 carbons and is typically used in packaging. It has mechanical and thermal properties similar to PETE, so it has similar usefulness, such as boil-in bag packaging. Nylon also offers good chemical resistance, toughness, and low gas permeability.

Ethylene vinyl alcohol . Ethylene vinyl alcohol (EVOH) is a copolymer of ethylene and vinyl alcohol. It is an excellent barrier to oil, fat, and oxygen. However, EVOH is moisture sensitive and is thus mostly used in multilayered co-extruded films in situation where it is not in direct contact with liquids.

Laminates and co-extrusions . Plastic materials can be manufactured either as a single film or as a combination of more than 1 plastic. There are 2 ways of combining plastics: lamination and co-extrusion. Lamination involves bonding together 2 or more plastics or bonding plastic to another material such as paper or aluminum (as discussed in the section on metal). Bonding is commonly achieved by use of water-, solvent-, or solids-based adhesives. After the adhesives are applied to 1 film, 2 films are passed between rollers to pressure bond them together. Lamination using laser rather than adhesives has also been used for thermoplastics (Kirwan and Strawbridge 2003). Lamination enables reverse printing, in which the printing is buried between layers and thus not subject to abrasion, and can add or enhance heat sealability.

In co-extrusion, 2 or more layers of molten plastics are combined during the film manufacture. This process is more rapid (requires 1 step in comparison to multiple steps with lamination) but requires materials that have thermal characteristics that allow co-extrusion. Because co-extrusion and lamination combine multiple materials, recycling is complicated. However, combining materials results in the additive advantage of properties from each individual material and often reduces the total amount of packaging material required. Therefore, co-extrusion and lamination can be sources of packaging reduction.

From Nicole Hoekstra (Western Washington University)

“If you research which 3D printing filaments can be printed without ventilation, you will find a short list that is considered very safe for use in libraries and classrooms (such as PLA and HIPS). You do not want to go too hot or too long though.

<https://3dprintingcanada.com/blogs/news/the-importance-of-ventilation-and-your-3d-printing-workspace>

Additionally, any plastic that only has carbon and hydrogen in them (polyethylene, polypropylene) are very safe to melt and be exposed to any off gassing while the plastic is hot. PE is basically candle wax with a longer molecule.

Stay away from acrylic, polycarbonate and definitely PVC. PVC gives off very harmful gasses when it degrades.”

Polylactic acid or polylactide (PLA)-

is a thermoplastic aliphatic polyester derived from renewable biomass, typically from fermented plant starch such as from corn, cassava, sugarcane or sugar beet pulp. In 2010, PLA had the second highest consumption volume of any bioplastic of the world.[3]

The name "polylactic acid" does not comply with IUPAC standard nomenclature, and is potentially ambiguous or confusing, because PLA is not a polyacid (polyelectrolyte), but rather a polyester

https://en.wikipedia.org/wiki/Polylactic_acid

HIPS – High Impact Polystyrene Sheet

HIPS - High Impact Polystyrene, it is a tough, rigid plastic material with high impact strength which can be guillotined, punched, routed or sawn easily, and is readily available in a wide variety of colours. Used widely for toys, packaging, signs, kicking plates, display and point of sale. If you are looking for a particular coloured plastic with good impact properties then HIPS is a first choice material. Polystyrene is particularly suitable for thermoforming meaning various shapes and objects can be produced from this material.

http://www.plasticsdirect.co.uk/html/HIPS_47.html

High Impact Polystyrene (HIPS)

High Impact Polystyrene (HIPS) is a versatile, economical and impact-resistant plastic that is easy to machine and fabricate. HIPS is often specified for low strength structural applications when impact resistance, machinability, and low

cost are required. It is frequently used machining pre-production prototypes since it has excellent dimensional stability and is easy to fabricate, paint, and glue.

Common Uses:

Consumer products: Appliance components, toy, TV and audio-visual equipment parts, recording tape cassettes, bicycle trailer, toys

Automotive industry: Instrument panels and fittings, gasoline tanks

Food Services: Hot and cold drinking cups

Office Products: Computer Housings

General Properties:

Maintains strength in high-impact applications

Can be painted

Recyclable with good property retention

Easily moldable

FDA compliant grades

Good dimensional stability

Good gloss

<http://www.blackwellplastics.com/HIPS.html>

How to Identify Different Types of Plastic:

<https://owlcation.com/stem/How-plastic-is-really-recycled>

Testing Plastics:

<https://www.twi-global.com/technical-knowledge/faqs/faq-how-using-simple-manual-tests-can-i-identify-an-unknown-plastic-material> :

Test no.Action

1. Look at the sample. Is it transparent, translucent or opaque?
2. Feel the sample. Does it bend? Can it be scratched? What does the surface feel like?

3. Cut the sample with a sharp knife. Does it cut easily? Are the edges smooth or jagged? Does it crumble or flake?
4. Subject the sample to a float test. Does it float or sink? (Note: not applicable to expanded foam materials. Water should be around room temperature).
5. Try to burn a small piece of the sample. What is the size and colour of the flame? Do molten drips fall from the sample and continue to burn? Does the sample self-extinguish? Is there any odour when the flame has been extinguished?

Material Test no. Observation

Low density

polyethylene

(LDPE) 1 Transparent only as thin film, translucent in thicker sections

2 Fairly flexible; soft, 'waxy' feel, easily scratched

3 Easily and smoothly cut

4 Floats

5 Not self-extinguishing; molten droplets which usually go out on reaching bench or floor; blue flame with yellow tip and little smoke, smell of burning candle/paraffin when flame is extinguished

High density

polyethylene

(HDPE) 1 Transparent only as thin film, translucent in thicker sections

2 Fairly stiff and hard, can be scratched by fingernail

3 Easily cut with smooth edges

4 Floats

5 Not self-extinguishing; molten droplets which usually go out on reaching bench or floor; blue flame with yellow tip and little smoke, smell of burning candle/paraffin when the flame is extinguished

Polypropylene

(PP) 1 Transparent only as thin film, translucent in thicker sections

2 Stiff; hard, can be scratched by fingernail

3 Easily cut, fairly smooth edges, when cut with chisel leaves white mark

4 Floats

5 Not self-extinguishing; molten droplets which usually go out on reaching bench or floor; flame mainly yellow with a trace of clear blue at the bottom; smell of burning candle/diesel when flame is extinguished.

Polyvinyl Chloride, Unplasticised

(uPVC) 1 Transparent (unless fillers or pigments have been added)

2 Stiff; hard

3 Fairly easy to cut, smooth edges

4 Sinks

5 Burns with difficulty, self-extinguishing; yellow flame, blue-green at bottom edges; unpleasant, acrid odour of hydrochloric acid.

3M Solutions for Plastics



Bonding, attaching, mounting, laminating,
fastening, sealing, labeling, protecting

3M Product Portfolio for applications success

| | | LSE (Low Surface Energy) | | | | HSE (High Surface Energy) | | |
|--------------------------|--|--------------------------|--|---|---------|---------------------------|-----|-----------|
| | | PTFE | Polypropylene | Polystyrene | Acrylic | PVC | ABS | Polyester |
| STRUCTURAL ADHESIVES | | | Two-part Acrylic | | | | | |
| | | | | Two-part Epoxy Two-part Urethane | | | | |
| | | | Instant Adhesive (CA) | | | | | |
| | | | Instant Adhesive (CA) Primer | | | | | |
| NON-STRUCTURAL ADHESIVES | | | Polyurethane Reactive (PUR) | | | | | |
| | | | Aerosol Cylinders Hot Melt Extrudable Hot Melt Sprayable Solvent-based*** Water-based Sealants | | | | | |
| BONDING TAPES | | | Bonding Films | | | | | |
| | | | Adhesive Transfer Tapes Double Coated Tapes General Purpose Foam Tapes 3M™ VHB™ Tapes | | | | | |
| OTHER SOLUTIONS | | | Reclosable Fasteners | | | | | |
| | | | | Protective Tapes (Short Term) - except PVCs | | | | |
| | | | High Performance Polyester Label Materials | | | | | |

NOTE: The optimal curing guideline for plastics solutions ranges from 72 hours to 7 days.
* Structural strength adhesives reach a minimum of 1,000 psi overlap shear strength.

** Non-structural strength adhesives typically reach less than 1,000 psi overlap shear strength.

*** Solvent-based adhesives may craze (attack) some surfaces.



With no surface preparation, 3M™ Scotch-Weld™ Structural Plastic Adhesive DP8005 bonds end caps on Low Surface Energy plastic fence posts. Handling strength in 2-3 hours.



3M™ Scotch-Weld™ Plastic & Rubber Instant Adhesive PR600 permanently bonds difficult-to-bond plastics and rubbers together, or in combination with metals and/or composites.



In bonding plastic feathers and nocks onto arrow shafts, 3M™ Scotch-Weld™ Industrial Plastic Adhesive 4475 dries quickly to a firm bond that resists plasticizers and water.



For thin bondlines in automotive interior trim attachment, 3M™ Quick Bonding Adhesive 360 bonds with strength greater than many thicker tapes.



3M™ Scotch-Weld™ Epoxy Adhesive 8405 readily bonds many difficult-to-bond plastics in applications ranging from computers to signage.



For ease of assembly and precise fit, die-cut 3M™ VHB™ Tape bonds and seals plastic components throughout a GPS unit.

Keeping pace with the growth in plastics products – 3M solutions for improved design, performance, and productivity

Applications success... for wherever people live, work, or play

In 1976 plastics had become the most commonly used material in the world. By 2001 plastics was the fourth largest manufacturing segment in the United States. Today, wherever you live, work, or play, the use of plastics is growing, and with it the use of 3M adhesive and tape technologies to assemble, protect, and label products made of plastics or plastics combined with metal, wood, or other materials.

3M adhesive and tape benefits

- Bond strength matched to the job, for example, replacing screws and other mechanical fasteners; bonding LSE plastics with little or no surface preparation
- Virtually invisible fastening for an aesthetically-pleasing product
- Increased material options – bond more plastics than ever, including inexpensive hard-to-bond plastics
- Increased manufacturing efficiency with faster assembly speed and fewer assembly steps in many applications
- Bond and seal simultaneously

This guide is an overview to help you match 3M technologies to specific thermoplastics for applications success.

Types of plastics

Thermoplastics are polymers that can be repeatedly softened with heat for molding, becoming solid when cooled.

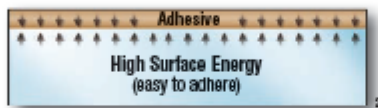
Thermosetting plastics soften with heat once, then cool to an insoluble solid.

Thermoset parts are easily bonded, while thermoplastics have a wide range of surface energy characteristics which must be considered for successful bonding or labeling.

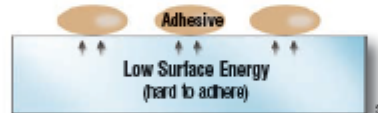
At the same time, however, thermoplastics are more commonly used because of a wide variety of production and end use properties. For example, polypropylene is inexpensive with high chemical resistance, but is hard to bond due to its low surface energy. Nylon is more expensive, resists wear and heat, and is easier to bond given its high surface energy.

Low to high surface energy

An unwaxed car hood exhibits high surface energy (HSE) and water spreads across the surface. Similar to water, adhesive on a high energy surface flows and "wets out" the surface. "Wetting" is necessary for effective bonding.



A waxed hood exhibits low surface energy (LSE). In effect, the "energy of the wax" repels the water, forcing it into beads. Adhesive also beads up and does not effectively wet an LSE



For bonding success with LSE thermoplastics, 3M offers several specially formulated adhesives and tapes.

Using the selection chart

This guide focuses on thermoplastics because of their complexity, versatility, and wide use. Thermoplastics are presented in the adjacent chart, moving left to right from low to high surface energy. At the intersections of 3M technology and plastic, 3M product numbers represent starting points for further evaluation.

For more information:
1-800-362-3550
www.3M.com/adhesives

| | 3M Solutions | Benefits |
|--------------------------|--|---|
| STRUCTURAL ADHESIVES | Two-part Acrylic | Versatile; eliminates or minimizes surface preparation even on LSE plastics |
| | Two-part Epoxy | Highest strength and elevated temperature resistance of all 3M Adhesives |
| | Two-part Urethane | Fast curing to a flexible, impact resistant bond; lower cost than epoxy or acrylic |
| | Instant Adhesive (CA) | One-part liquid reaches handling strength in 5-10 seconds at room temperature |
| | Instant Adhesive (CA) Primer** | Prepares LSE plastics for secure adhesive bonding |
| | Polyurethane Reactive (PUR) | Hot melt production speed with performance typical of structural adhesive |
| NON-STRUCTURAL ADHESIVES | Aerosol | Convenient fistful of bonding power and versatility |
| | Cylinders | Aerosol convenience, bulk productivity for large area coverage |
| | Hot Melt Extrudable | Fast bonding with a targeted bead of solventless adhesive; move assemblies immediately |
| | Hot Melt Sprayable | Fast wide area application; fast bonding for lightweight parts; solventless |
| | Solvent-based | Solvent speeds and strengthens the bond between a wide range of plastics and other surfaces |
| | Water-based | Easier environmental compliance; speed to handling exceeds most solvent-based systems |
| BONDING TAPES | Sealants | Flexible seals on many plastics to keep air, wind, dirt, and water in or out |
| | Bonding Films | Precision shape, size, and fit; bonds in seconds with heat; solventless |
| | Adhesive Transfer Tapes | Clean, precise application of dry pressure sensitive adhesive for bonding on contact |
| | Double Coated Tapes | Benefits of adhesive transfer tapes but with a carrier for handling stability and die-cutting |
| OTHER SOLUTIONS | General Purpose Foam Tapes | Benefits of double coated tapes but with foam carrier for gap filling |
| | 3M™ VHB™ Tapes | Pressure sensitive adhesive on a roll to replace mechanical fasteners and solvent welding |
| | Reclosable Fasteners | Stick to a variety of plastic surfaces that need repeated attachments and removals |
| OTHER SOLUTIONS | Protective Tapes (Short Term) | Protect plastic surfaces from scratching, abrasion, and chipping; remove cleanly |
| | High Performance Polyester Label Materials | Abrasion and solvent resistant facestocks; permanent adhesion even to LSE plastics |

NOTE: The technical information and data on these pages should be considered representative. A variety of other bonding, joining, and sealing products are available for these as well as v and/or based on processing techniques. Since various grades of a particular resin can can product selection should only be made by the users after evaluation of sample bonds and consid

Matching 3M technology to the thermoplastics of your choice...even LSE

| LSE (Low Surface Energy) | | | | | | | | | |
|--------------------------|--|--|----------------------------------|----------------------------------|--|---|--|--|---|
| | PTFE | Polypropylene | TPO | Polyethylene | Polystyrene | Acrylic | PVC - Plasticized | PVC - Unplasticized | ABS |
| - | - | DP8005, DP8010 | DP8005, DP8010 | DP8005, DP8010 | DP807, DP810, DP812, DP825, DP8010 | DP807, DP810, DP812, DP825, DP8010 | DP807, DP810, DP812, DP825, DP8010 | DP807, DP810, DP812, DP825, DP8010 | DP807, DP810, DP812, DP825, DP8010 |
| - | - | - | - | - | 2216 B/A, DP100 Plus, DP125, DP420, DP460, DP8405 | 2216 B/A, DP100 Plus, DP125, DP420, DP460, DP8405 | 2216 B/A, DP100 Plus, DP125, DP420, DP460, DP8405 | 2216 B/A, DP100 Plus, DP125, DP420, DP460, DP8405 | 2216 B/A, DP100 Plus, DP125, DP420, DP460, DP8405 |
| - | - | - | - | - | 3532 B/A, DP604NS, DP605NS, DP640 | 3532 B/A, DP604NS, DP605NS, DP640 | 3532 B/A, DP604NS, DP605NS, DP640 | 3532 B/A, DP604NS, DP605NS, DP640 | 3532 B/A, DP604NS, DP605NS, DP640 |
| Primer AC77* with SF100 | Primer AC77* with PR600 or SF100 | Primer AC77* with PR600 or SF100 | Primer AC77* with PR600 or SF100 | Primer AC77* with PR600 or SF100 | CA40H, CA100, PR600, SF100 | CA40H, CA100, PR600, SF100 | CA40H, CA100, PR600, SF100 | CA40H, CA100, PR600, SF100 | CA40H, CA100, PR600, SF100 |
| AC77* | AC77* | AC77* | AC77* | AC77* | None Needed | None Needed | None Needed | None Needed | None Needed |
| - | - | - | - | - | EZ250030, EZ250150, TE031, TS230 | EZ250030, EZ250150, TE031, TS230 | EZ250030, EZ250150, TE031, TS230 | EZ250030, EZ250150, TE031, TS230 | EZ250030, EZ250150, TE031, TS230 |
| - | 77, 90 | 77, 90 | 72, 77, 90 | 78 | 77, 90 | 80 | 77, 90 | 77, 90 | 77, 90 |
| - | 90, 94 | 78HT, 90 | 90, 94 | 70, 78HT | 90, 94 | 4491 | 90, 94 | 90, 94 | 90, 94 |
| - | 3731, 3748, 3764, 3796 | 3731, 3764, 3792LM, 3796 | 3731, 3748, 3764, 3796 | 3764, 3796 | 3747, 3764, 3792LM, 3796 | 3789, 3796 | 3731, 3747, 3764, 3796 | 3748, 3764, 3792LM, 3796 | |
| - | 6111HT, 6116 | 6111HT, 6116 | 6111HT, 6116 | 6111HT | 6111HT | 6111HT | 6111HT | 6111HT | |
| - | 4693 | 4693 | 4693 | 1357, 4693 | 5, 1357, 2262, 4475, 4693 | 5, 1099, 2262, 4475 | 5, 2262, 4475, 4693 | 5, 1099, 4693 | |
| - | 2000NF | 2000NF | 2000NF | 30NF, 49, 2000NF | 30NF, 49, 100, 2000NF | 30NF, 49, 2000NF, 4224-NF | 30NF, 49, 100, 2000NF | 30NF, 49, 100, 2000NF | |
| - | 5354 | 5354 | 5354 | 540, 606NF, 5354 | 540, 560, 5354 | 800 | 540, 606NF, 800, 5354 | 540, 800, 5354 | |
| - | - | - | - | 615, 615S, 668, 690 | 615, 615S, 668, 690 | - | 615, 615S, 668, 690 | 615, 615S, 668, 690 | |
| - | 926 (ATG), 9472LE, 9626, 9627 | 926 (ATG), F9465PC, 9472LE, 9626, 9627 | 9472LE, 9626, 9627 | 969 (ATG), 9442, 9472LE | 468MP, 950, 969 (ATG), F9469PC, 9626, 9627 | 969 (ATG), F9473PC | 468MP, 950, 969 (ATG), 9472LE, F9473PC, 9626, 9627 | 468MP, 950, 969 (ATG), 9472LE, F9473PC, 9626, 9627 | |
| - | 9086, 9087, 9088, 9088FL, 9495LE, 9500PC, 9629PC | 9495LE, 9690, 9629PC | 9495LE, 9629PC | 9495LE, 9500PC | 444, 9086, 9495MP, 9500PC, 9629PC | 9087 | 9086, 9087, 9088, 9088FL, 9495LE, 9629PC | 9086, 9087, 9088, 9088FL, 9495LE, 9495MP, 9629PC | |
| - | 4462, 4466 | 4462, 4466 | 4462, 4466 | 4016, 4032, 4492, 4496 | 4016, 4032, 4462, 4496 | 4016, 4032, 4492, 4496 | 4016, 4032, 4492, 4496 | 4016, 4032, 4496 | |
| - | Primer 94* with 4941 or 5952 | Primer 94* with 4941 or 5952 | Primer 94* with 4941 or 5952 | Primer 94* with 4941 or 5952 | 4910, 4941, 5952 | 4941 | 4941, 5952 | 4941, 5952 | |
| - | SJ3530/SJ3531, SJ3540 | SJ3530/SJ3531, SJ3540 | SJ3530/SJ3531, SJ3540 | SJ3550, SJ3571/SJ3572 | SJ3550, SJ3571/SJ3572 | SJ3522/SJ3523, SJ3560 | SJ3550, SJ3560, SJ3571/SJ3572 | SJ3550, SJ3571/SJ3572 | |
| - | - | - | - | - | Contact 3M for recommended products*** 1-800-241-2031. | - | - | Contact 3M for recommended products*** 1-800-241-2031. | |
| - | 7868, 7871 | 7868, 7871 | 7868, 7871 | 7868, 7871 | 7816, 7868, 7871 | 7816, 7868, 7871 | 7816, 7868, 7871 | 7816, 7868, 7871 | |

are typical only and should not be used for specification purposes. Always consult 3M technical literature for details on LSE plastics and other plastics. Many plastics can vary from supplier to supplier in different additives or plasticizers which can affect adhesion. Final adhesion is dependent on a variety of factors such as application and end-use conditions.

* Not for sale or use in California.

*** Recommended for a wide variety of LSE plastics and hard-to-bond elastomers:
 - AC77 (with SF100) for HIPS (High Impact Polystyrene), PBT (Polybutylene Terephthalate), PMP (Polymethylpentene), POM (Polycyclohexylene acetal resin, STYRON™, VALOX™, TPC™, and ISORPLAST™)
 - AC78 (with PR1500, SF20, SF100, or SF600) for Silicone, Santoprene™, fluoro elastomer, and EPDM.

Thermoplastics properties and typical applications

| HSE (High Surface Energy) | | | | |
|---------------------------|---|---|--|---|
| | Polycarbonate | Polyester (PET) | Polyurethane (RIM) | Nylon |
| DP, DP125, DP8405 | DP807, DP810, DP812, DP825, DP8010 | DP807, DP810, DP812, DP825, DP8010 | DP807, DP810, DP812, DP825, DP8010 | DP807, DP810, DP812, DP825, DP8010 |
| Plus, DP125, DP8405 | 2216 B/A, DP100 Plus, DP125, DP420, DP460, DP6405 | 2216 B/A, DP100 Plus, DP125, DP420, DP460, DP6405 | 2216 B/A, DP100 Plus, DP125, DP420, DP460, DP6405 | 2216 B/A, DP100 Plus, DP125, DP420, DP460, DP6405 |
| 904NS, 340 | 3532 B/A, DP604NS, DP605NS, DP640 | 3532 B/A, DP604NS, DP605NS, DP640 | 3532 B/A, DP604NS, DP605NS, DP640 | 3532 B/A, DP604NS, DP605NS, DP640 |
| FR600, SB20, SF100 | CA40H, CA100, PR600, SB20, SF100 | CA40H, CA100, PR600, SB20, SF100 | CA40H, CA100, PR600, SF100 | CA40H, CA100, PR600, SF100 |
| | None Needed | None Needed | None Needed | None Needed |
| 250150, TE031, TS230 | EZ250030, EZ250150, TE031, TS230 | EZ17010, EZ250030 | EZ17010, TE031, TE040 | EZ250150, TE031 |
| | 77, 90 | 77, 90 | 74, 77, 90 | 77, 90 |
| | 90, 94 | 90, 94 | 74, 92 | 90, 94 |
| | 3731, 3747, 3748, 3764, 3796 | 3731, 3764, 3796 | 3731, 3748, 3764, 3796 | 3731, 3796 |
| | 611HT | 611HT | 611HT | 611HT |
| | 5, 1099, 4475, 4693 | 1099, 1357, 4693 | 847, 1099 | 1099, 1357, 4693 |
| | 30NF, 49, 100, 2000NF | 30NF, 49, 100, 2000NF | 30NF, 49, 100, 2000NF | 30NF, 49, 100, 2000NF |
| 4 | 540, 800, 5354 | 540, 800, 5354 | 540 | 560, 800, 5354 |
| 8, 690 | 615, 615S, 668, 690 | 615, 615S, 668, 690 | 615, 615S, 668, 690 | 615, 615S, 668, 690 |
| 669 (ATG), 3PC, | 468MP, 926 (ATG), 950, 969 (ATG), 9472LE, F9473PC, 9626, 9627 | 468MP, 926 (ATG), 950, 969 (ATG), 9472LE, F9473PC, 9626, 9627 | 468MP, 950, 969 (ATG), 9472LE, F9473PC, 9626, 9627 | 468MP, 926 (ATG), 950, 969 (ATG), 9472LE, F9473PC, 9627 |
| 9088, LE, IPC | 9086, 9087, 9088, 9088FL, 9495LE, 9495MP, 9629PC | 9086, 9087, 9088, 9088FL, 9495LE, 9495MP, 9629PC | 9086, 9087, 9088, 9088FL, 9495LE, 9495MP, 9629PC | 9086, 9087, 9088, 9088FL, 9495LE, 9495MP, 9629PC |
| 492, 4496 | 4016, 4032, 4492, 4496 | 4016, 4032, 4492, 4496 | 4016, 4032, 4492, 4496 | 4016, 4032, 4492, 4496 |
| | 4910, 4941, 5952 | 4941, 5952 | 4941, 5952 | 4941, 5952 |
| 2 | SJ3550, SJ3571/SJ3572 | SJ3550, SJ3571/SJ3572 | SJ3550, SJ3571/SJ3572 | SJ3550, SJ3571/SJ3572 |
| | Contact 3M for recommended products*** 1-800-241-2031. | Contact 3M for recommended products*** 1-800-241-2031. | Contact 3M for recommended products*** 1-800-241-2031. | - |
| 871 | 7816, 7868, 7871 | 7816, 7868, 7871 | 7816, 7868, 7871 | 7816, 7868, 7871 |

*** Short term surface protection tape solutions vary depending on substrate and conditions of application/usage. For product selection guidance, please use the online product selector tool at www.3M.com/protectiveTapes.

PTFE (Polytetrafluoroethylene)

- Very low friction; excellent dielectric
- Slippery, non-stick surfaces; insulator

Polypropylene

- Toughness; chemical resistance
- Furniture, luggage, containers, fishing tackle

TPO (Thermoplastic polyolefin)

- UV and impact resistance for outdoors
- Automotive bumper fascia, roofing membrane

Polyethylene

- Water, oil, and solvent resistance
- Housewares; many injection molded parts

Polystyrene

- Lightweight, rigid, water resistance
- Toys, decorative panels, refrigerator trays

Acrylic

- Stiff, durable, weather resistance; unlimited color
- Signs, dials, appliance trim, shower tray, light cover

PVC (Polyvinyl chloride)

- Lightweight, stiff, hard, durable
- Window extrusions; gutters

ABS (Acrylonitrile-Butadiene-Styrene)

- Tough, rigid, heat/weathering/chemical resistance
- Refrigerator liner, housings, dashboard, handles

Polycarbonate

- High impact resistance, toughness, transparency
- Medical equipment, electrical/electronics, toys

Polyester (PET – Polyethylene terephthalate)

- Electrical properties, chemical/abrasion resistance
- Motor housing, small appliances, cable connectors

Polyurethane (RIM – Reaction Injection Molding)

- Hold fine detail, tough, wear resistance
- Carved wood simulations, housings

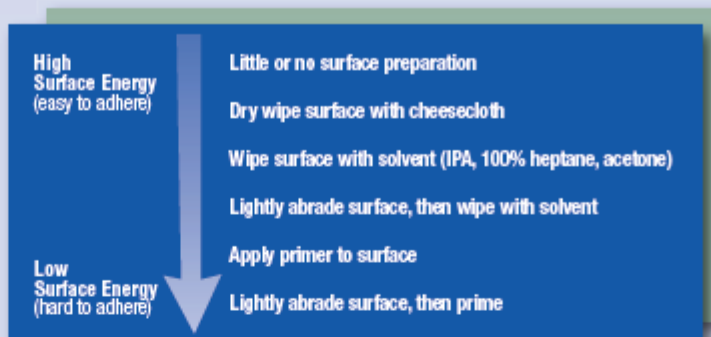
Nylon

- Impact/fatigue/abrasion resistance, low coefficient of friction, good electrical properties
- Bearings, gears, hinges, casters, valves, bike wheels

3M Solutions for Plastics - Surface Preparation

Surface preparation will typically enhance adhesion and contribute to greater consistency of bond strength. This is especially important when moving from High Surface Energy plastics (which are easier to bond) to Low Surface Energy plastics (which are more difficult to bond).

For any type of plastics, it's important to consider the different options for surface preparation. While 3M has products that minimize or eliminate surface preparation for LSE plastics, the general rule of thumb is the lower the surface energy, the greater the need for additional surface preparation steps. All adhesives are recommended to have good surface preparations before applying the adhesive.



Graphic shows surface preparation methods which may be required to maximize bond strength.

Solutions through science and service

Solutions in this brochure are only a few of the many available from 3M now. 3M R&D is also ongoing with more than a billion dollars a year invested to develop innovative new solutions for the future. But since science and innovation are practical only to the extent that end users can put them to work, 3M also emphasizes service:

- 3M representatives for sales assistance in more than 50 countries
- Highly trained technical service teams to help customers evaluate 3M products for specific applications
- Authorized distributor networks for local assistance and product availability
- Authorized converters to adapt 3M technologies to meet special requirements for form, fit, and function

More information

- **3M® Adhesives, Tapes, Reclosable Fasteners, and Protective Products:** 1-800-362-3550 or www.3M.com/adhesives
- **3M® Performance Label Materials:** 1-800-422-8116 or www.3M.com/convertor
- **3M products converted to precise size and shape:** 1-800-223-7427 or www.3M.com/convertor

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Converter Markets

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www.3M.com/convertor

Converter Markets Performance Label Materials

1030 Lake Road
Medina, OH 44256
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www.3M.com/convertor

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70-0709-4146-6

Heat Gun Temperature Settings

| II | °F |
|----|-----|
| 1 | 102 |
| 2 | 108 |
| 3 | 148 |
| 4 | 201 |
| 5 | 244 |
| 6 | 289 |
| 7 | 335 |

| III | °F |
|-----|-----|
| 1 | 166 |
| 2 | 210 |
| 3 | 235 |
| 4 | 320 |
| 5 | 380 |
| 6 | 459 |
| 7 | 490 |



Safety Data Sheet

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|------------------------|-----------|-------------------------|----------|
| Document Group: | 16-0795-1 | Version Number: | 11.00 |
| Issue Date: | 05/21/18 | Supersedes Date: | 08/09/17 |

SECTION 1: Identification

1.1. Product identifier

3M™ Scotch-Weld™ Low Odor Acrylic Adhesive DP810NS Tan and Low Odor Acrylic Adhesive 810NS Tan, Part B

Product Identification Numbers

62-2799-8730-9

1.2. Recommended use and restrictions on use

Recommended use

Structural adhesive

1.3. Supplier's details

| | |
|----------------------|---|
| MANUFACTURER: | 3M |
| DIVISION: | Industrial Adhesives and Tapes Division |
| ADDRESS: | 3M Center, St. Paul, MN 55144-1000, USA |
| Telephone: | 1-888-3M HELPS (1-888-364-3577) |

1.4. Emergency telephone number

1-800-364-3577 or (651) 737-6501 (24 hours)

SECTION 2: Hazard identification

2.1. Hazard classification

Serious Eye Damage/Irritation: Category 1.

Skin Corrosion/Irritation: Category 2.

Skin Sensitizer: Category 1.

2.2. Label elements

Signal word

Danger

Symbols

Corrosion | Exclamation mark |

Pictograms

**Hazard Statements**

Causes serious eye damage.
Causes skin irritation.
May cause an allergic skin reaction.

Precautionary Statements**Prevention:**

Avoid breathing dust/fume/gas/mist/vapors/spray.
Wear protective gloves and eye/face protection.
Wash thoroughly after handling.
Contaminated work clothing must not be allowed out of the workplace.

Response:

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
IF ON SKIN: Wash with plenty of soap and water.
Immediately call a POISON CENTER or doctor/physician.
If skin irritation or rash occurs: Get medical advice/attention.
Take off contaminated clothing and wash it before reuse.

Disposal:

Dispose of contents/container in accordance with applicable local/regional/national/international regulations.

2% of the mixture consists of ingredients of unknown acute dermal toxicity.

SECTION 3: Composition/information on ingredients

| Ingredient | C.A.S. No. | % by Wt |
|---|------------|------------------------|
| Phenoxyethyl Methacrylate | 10595-06-9 | 10 - 40 Trade Secret * |
| 2-Hydroxyethyl Methacrylate | 868-77-9 | 10 - 30 Trade Secret * |
| Hydroxypropyl Methacrylate | 27813-02-1 | 10 - 30 Trade Secret * |
| Acrylate Oligomer | 41637-38-1 | 5 - 20 Trade Secret * |
| Acrylonitrile-Butadiene Polymer | 9010-81-5 | 5 - 20 Trade Secret * |
| Methyl Acrylate-Butadiene-Styrene Polymer | 25101-28-4 | 5 - 20 Trade Secret * |
| Modified Silica | 68611-44-9 | 1 - 10 Trade Secret * |
| 2-Hydroxyethyl Methacrylate Phosphate | 52628-03-2 | < 4 Trade Secret * |
| 4-Methoxyphenol | 150-76-5 | < 1 Trade Secret * |
| Phenothiazine | 92-84-2 | < 1 Trade Secret * |

*The specific chemical identity and/or exact percentage (concentration) of this composition has been withheld as a trade secret.

SECTION 4: First aid measures**4.1. Description of first aid measures****Inhalation:**

Remove person to fresh air. If you feel unwell, get medical attention.

Skin Contact:

Immediately wash with soap and water. Remove contaminated clothing and wash before reuse. If signs/symptoms develop, get medical attention.

Eye Contact:

Immediately flush with large amounts of water for at least 15 minutes. Remove contact lenses if easy to do. Continue rinsing. Immediately get medical attention.

If Swallowed:

Rinse mouth. If you feel unwell, get medical attention.

4.2. Most important symptoms and effects, both acute and delayed

See Section 11.1. Information on toxicological effects.

4.3. Indication of any immediate medical attention and special treatment required

Not applicable

SECTION 5: Fire-fighting measures

5.1. Suitable extinguishing media

In case of fire: Use a fire fighting agent suitable for ordinary combustible material such as water or foam to extinguish.

5.2. Special hazards arising from the substance or mixture

Closed containers exposed to heat from fire may build pressure and explode.

Hazardous Decomposition or By-Products

| <u>Substance</u> | <u>Condition</u> |
|-------------------------------|-------------------|
| Carbon monoxide | During Combustion |
| Carbon dioxide | During Combustion |
| Hydrogen Chloride | During Combustion |
| Oxides of Nitrogen | During Combustion |
| Toxic Vapor, Gas, Particulate | During Combustion |

5.3. Special protective actions for fire-fighters

Wear full protective clothing, including helmet, self-contained, positive pressure or pressure demand breathing apparatus, bunker coat and pants, bands around arms, waist and legs, face mask, and protective covering for exposed areas of the head.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Evacuate area. Ventilate the area with fresh air. For large spill, or spills in confined spaces, provide mechanical ventilation to disperse or exhaust vapors, in accordance with good industrial hygiene practice. Refer to other sections of this SDS for information regarding physical and health hazards, respiratory protection, ventilation, and personal protective equipment.

6.2. Environmental precautions

Avoid release to the environment. For larger spills, cover drains and build dikes to prevent entry into sewer systems or bodies of water.

6.3. Methods and material for containment and cleaning up

Contain spill. Working from around the edges of the spill inward, cover with bentonite, vermiculite, or commercially available inorganic absorbent material. Mix in sufficient absorbent until it appears dry. Remember, adding an absorbent

material does not remove a physical, health, or environmental hazard. Collect as much of the spilled material as possible. Place in a closed container approved for transportation by appropriate authorities. Clean up residue with an appropriate solvent selected by a qualified and authorized person. Ventilate the area with fresh air. Read and follow safety precautions on the solvent label and SDS. Seal the container. Dispose of collected material as soon as possible in accordance with applicable local/regional/national/international regulations.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

For industrial or professional use only. Do not use in a confined area with minimal air exchange. Avoid breathing dust/fume/gas/mist/vapors/spray. Do not get in eyes, on skin, or on clothing. Do not eat, drink or smoke when using this product. Wash thoroughly after handling. Contaminated work clothing should not be allowed out of the workplace. Avoid release to the environment. Wash contaminated clothing before reuse. Keep away from reactive metals (eg. Aluminum, zinc etc.) to avoid the formation of hydrogen gas that could create an explosion hazard.

7.2. Conditions for safe storage including any incompatibilities

Store away from heat. Store away from amines.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational exposure limits

If a component is disclosed in section 3 but does not appear in the table below, an occupational exposure limit is not available for the component.

| Ingredient | C.A.S. No. | Agency | Limit type | Additional Comments |
|-------------------|------------|--------|--|---------------------|
| 4-Methoxyphenol | 150-76-5 | ACGIH | TWA:5 mg/m3 | |
| SILICA, AMORPHOUS | 68611-44-9 | OSHA | TWA concentration:0.8 mg/m3;TWA:20 millions of particles/cu. ft. | |
| Phenothiazine | 92-84-2 | ACGIH | TWA:5 mg/m3 | SKIN |

ACGIH : American Conference of Governmental Industrial Hygienists
 AIHA : American Industrial Hygiene Association
 CMRG : Chemical Manufacturer's Recommended Guidelines
 OSHA : United States Department of Labor - Occupational Safety and Health Administration
 TWA: Time-Weighted-Average
 STEL: Short Term Exposure Limit
 CEIL: Ceiling

8.2. Exposure controls

8.2.1. Engineering controls

Use general dilution ventilation and/or local exhaust ventilation to control airborne exposures to below relevant Exposure Limits and/or control dust/fume/gas/mist/vapors/spray. If ventilation is not adequate, use respiratory protection equipment.

8.2.2. Personal protective equipment (PPE)

Eye/face protection

Select and use eye/face protection to prevent contact based on the results of an exposure assessment. The following eye/face protection(s) are recommended:

- Full Face Shield
- Indirect Vented Goggles

Skin/hand protection

Select and use gloves and/or protective clothing approved to relevant local standards to prevent skin contact based on the

results of an exposure assessment. Selection should be based on use factors such as exposure levels, concentration of the substance or mixture, frequency and duration, physical challenges such as temperature extremes, and other use conditions. Consult with your glove and/or protective clothing manufacturer for selection of appropriate compatible gloves/protective clothing. Note: Nitrile gloves may be worn over polymer laminate gloves to improve dexterity. Gloves made from the following material(s) are recommended: Polymer laminate

Respiratory protection

An exposure assessment may be needed to decide if a respirator is required. If a respirator is needed, use respirators as part of a full respiratory protection program. Based on the results of the exposure assessment, select from the following respirator type(s) to reduce inhalation exposure:

Half facepiece or full facepiece air-purifying respirator suitable for organic vapors and particulates

For questions about suitability for a specific application, consult with your respirator manufacturer.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

| | |
|---|---|
| General Physical Form: | Liquid |
| Specific Physical Form: | Paste |
| Odor, Color, Grade: | Slight fragrance, green |
| Odor threshold | <i>No Data Available</i> |
| pH | <i>Not Applicable</i> |
| Melting point | <i>Not Applicable</i> |
| Boiling Point | 87 °C |
| Flash Point | > 200 °F [<i>Test Method: Closed Cup</i>] |
| Evaporation rate | <i>No Data Available</i> |
| Flammability (solid, gas) | Not Applicable |
| Flammable Limits(LEL) | <i>No Data Available</i> |
| Flammable Limits(UEL) | <i>No Data Available</i> |
| Vapor Pressure | ≤0.1 mmHg |
| Vapor Density | <i>No Data Available</i> |
| Density | 1.07 g/ml |
| Specific Gravity | 1.07 [<i>Ref Std: WATER=1</i>] |
| Solubility in Water | Slight (less than 10%) |
| Solubility- non-water | <i>No Data Available</i> |
| Partition coefficient: n-octanol/ water | <i>No Data Available</i> |
| Autoignition temperature | <i>No Data Available</i> |
| Decomposition temperature | <i>No Data Available</i> |
| Viscosity | 90,000 centipoise |
| Hazardous Air Pollutants | < 40 % weight [<i>Test Method: Calculated</i>] |
| Molecular weight | <i>No Data Available</i> |
| VOC Less H ₂ O & Exempt Solvents | 3.1 g/l [<i>Details: when used as intended with Part A</i>] |
| VOC Less H ₂ O & Exempt Solvents | 0.3 % [<i>Details: when used as intended with Part A</i>] |
| VOC Less H ₂ O & Exempt Solvents | 319 g/l [<i>Details: as supplied</i>] |

SECTION 10: Stability and reactivity

10.1. Reactivity

This material may be reactive with certain agents under certain conditions - see the remaining headings in this section.

10.2. Chemical stability

Stable.

10.3. Possibility of hazardous reactions

Hazardous polymerization may occur.

10.4. Conditions to avoid

Heat

Sparks and/or flames

Heat is generated during cure. Do not cure a mass larger than 50 grams in a confined space to prevent a premature exothermic reaction with production of intense heat and smoke.

10.5. Incompatible materials

Amines

Reducing agents

Reactive metals

10.6. Hazardous decomposition products

Substance

Condition

None known.

Refer to section 5.2 for hazardous decomposition products during combustion.

SECTION 11: Toxicological information

The information below may not be consistent with the material classification in Section 2 if specific ingredient classifications are mandated by a competent authority. In addition, toxicological data on ingredients may not be reflected in the material classification and/or the signs and symptoms of exposure, because an ingredient may be present below the threshold for labeling, an ingredient may not be available for exposure, or the data may not be relevant to the material as a whole.

11.1. Information on Toxicological effects

Signs and Symptoms of Exposure

Based on test data and/or information on the components, this material may produce the following health effects:

Inhalation:

Respiratory Tract Irritation: Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain.

Skin Contact:

Skin Irritation: Signs/symptoms may include localized redness, swelling, itching, dryness, cracking, blistering, and pain.

Allergic Skin Reaction (non-photo induced): Signs/symptoms may include redness, swelling, blistering, and itching.

Photosensitization: Signs/symptoms may include a sunburn-like reaction such as blistering, redness, swelling, and itching from minor exposure to sunlight.

Eye Contact:

Corrosive (Eye Burns): Signs/symptoms may include cloudy appearance of the cornea, chemical burns, severe pain, tearing, ulcerations, significantly impaired vision or complete loss of vision.

Ingestion:

Gastrointestinal Irritation: Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Toxicological Data

If a component is disclosed in section 3 but does not appear in a table below, either no data are available for that endpoint or the data are not sufficient for classification.

Acute Toxicity

| Name | Route | Species | Value |
|---|--------------------------------|------------------------|--|
| Overall product | Dermal | | No data available; calculated ATE >5,000 mg/kg |
| Overall product | Ingestion | | No data available; calculated ATE >5,000 mg/kg |
| Phenoxyethyl Methacrylate | Dermal | | LD50 estimated to be 2,000 - 5,000 mg/kg |
| Phenoxyethyl Methacrylate | Ingestion | | LD50 estimated to be 2,000 - 5,000 mg/kg |
| 2-Hydroxyethyl Methacrylate | Dermal | Rabbit | LD50 > 5,000 mg/kg |
| 2-Hydroxyethyl Methacrylate | Ingestion | Rat | LD50 5,564 mg/kg |
| Methyl Acrylate-Butadiene-Styrene Polymer | Dermal | | LD50 estimated to be > 5,000 mg/kg |
| Hydroxypropyl Methacrylate | Dermal | Rabbit | LD50 > 5,000 mg/kg |
| Hydroxypropyl Methacrylate | Ingestion | Rat | LD50 > 2,000 mg/kg |
| Methyl Acrylate-Butadiene-Styrene Polymer | Ingestion | Rat | LD50 > 5,000 mg/kg |
| Acrylonitrile-Butadiene Polymer | Dermal | | LD50 estimated to be > 5,000 mg/kg |
| Acrylonitrile-Butadiene Polymer | Ingestion | | LD50 estimated to be 2,000 - 5,000 mg/kg |
| Acrylate Oligomer | Dermal | Professional judgement | LD50 estimated to be > 5,000 mg/kg |
| Acrylate Oligomer | Ingestion | Rat | LD50 > 2,000 mg/kg |
| Modified Silica | Dermal | Rabbit | LD50 > 5,000 mg/kg |
| Modified Silica | Inhalation-Dust/Mist (4 hours) | Rat | LC50 > 0.691 mg/l |
| Modified Silica | Ingestion | Rat | LD50 > 5,110 mg/kg |
| 2-Hydroxyethyl Methacrylate Phosphate | Ingestion | Rat | LD50 > 2,000 mg/kg |
| 4-Methoxyphenol | Dermal | Rat | LD50 > 2,000 mg/kg |
| 4-Methoxyphenol | Ingestion | Rat | LD50 1,600 mg/kg |
| Phenothiazine | Dermal | Rat | LD50 > 2,000 mg/kg |
| Phenothiazine | Ingestion | Rat | LD50 1,370 mg/kg |

ATE = acute toxicity estimate

Skin Corrosion/Irritation

| Name | Species | Value |
|---------------------------------------|------------------------|---------------------------|
| 2-Hydroxyethyl Methacrylate | Rabbit | Minimal irritation |
| Phenoxyethyl Methacrylate | similar compounds | Irritant |
| Hydroxypropyl Methacrylate | Rabbit | Minimal irritation |
| Acrylonitrile-Butadiene Polymer | Professional judgement | No significant irritation |
| Modified Silica | Rabbit | No significant irritation |
| 2-Hydroxyethyl Methacrylate Phosphate | Rabbit | Corrosive |
| 4-Methoxyphenol | Rabbit | Mild irritant |
| Phenothiazine | Rabbit | No significant irritation |

Serious Eye Damage/Irritation

| Name | Species | Value |
|---------------------------------|------------------------|---------------------------|
| 2-Hydroxyethyl Methacrylate | Rabbit | Moderate irritant |
| Phenoxyethyl Methacrylate | similar compounds | Severe irritant |
| Hydroxypropyl Methacrylate | Rabbit | Moderate irritant |
| Acrylonitrile-Butadiene Polymer | Professional judgement | No significant irritation |

| | | |
|---------------------------------------|------------------------|---------------------------|
| | nt | |
| Modified Silica | Rabbit | No significant irritation |
| 2-Hydroxyethyl Methacrylate Phopshate | similar health hazards | Corrosive |
| 4-Methoxyphenol | Rabbit | Severe irritant |
| Phenothiazine | Rabbit | Mild irritant |

Skin Sensitization

| Name | Species | Value |
|---------------------------------------|------------------|----------------|
| 2-Hydroxyethyl Methacrylate | Human and animal | Sensitizing |
| Hydroxypropyl Methacrylate | Human and animal | Sensitizing |
| Acrylate Oligomer | Guinea pig | Not classified |
| Modified Silica | Human and animal | Not classified |
| 2-Hydroxyethyl Methacrylate Phopshate | Mouse | Sensitizing |
| 4-Methoxyphenol | Guinea pig | Sensitizing |
| Phenothiazine | Guinea pig | Sensitizing |

Photosensitization

| Name | Species | Value |
|---------------|---------|-------------|
| Phenothiazine | Human | Sensitizing |

Respiratory Sensitization

For the component/components, either no data are currently available or the data are not sufficient for classification.

Germ Cell Mutagenicity

| Name | Route | Value |
|---------------------------------------|----------|--|
| 2-Hydroxyethyl Methacrylate | In vivo | Not mutagenic |
| 2-Hydroxyethyl Methacrylate | In Vitro | Some positive data exist, but the data are not sufficient for classification |
| Phenoxyethyl Methacrylate | In Vitro | Not mutagenic |
| Hydroxypropyl Methacrylate | In vivo | Not mutagenic |
| Hydroxypropyl Methacrylate | In Vitro | Some positive data exist, but the data are not sufficient for classification |
| Acrylate Oligomer | In Vitro | Not mutagenic |
| Modified Silica | In Vitro | Not mutagenic |
| 2-Hydroxyethyl Methacrylate Phopshate | In Vitro | Not mutagenic |
| Phenothiazine | In Vitro | Not mutagenic |
| Phenothiazine | In vivo | Not mutagenic |

Carcinogenicity

| Name | Route | Species | Value |
|----------------------------|---------------|-------------------------|--|
| Hydroxypropyl Methacrylate | Inhalation | Multiple animal species | Not carcinogenic |
| Modified Silica | Not Specified | Mouse | Some positive data exist, but the data are not sufficient for classification |

Reproductive Toxicity

Reproductive and/or Developmental Effects

| Name | Route | Value | Species | Test Result | Exposure Duration |
|---------------------------------------|-----------|--|---------|-----------------------|--------------------------------|
| 2-Hydroxyethyl Methacrylate | Ingestion | Not classified for female reproduction | Rat | NOAEL 1,000 mg/kg/day | prematuring & during gestation |
| 2-Hydroxyethyl Methacrylate | Ingestion | Not classified for male reproduction | Rat | NOAEL 1,000 mg/kg/day | 49 days |
| 2-Hydroxyethyl Methacrylate | Ingestion | Not classified for development | Rat | NOAEL 1,000 mg/kg/day | prematuring & during gestation |
| Hydroxypropyl Methacrylate | Ingestion | Not classified for female reproduction | Rat | NOAEL 1,000 mg/kg/day | prematuring into lactation |
| Hydroxypropyl Methacrylate | Ingestion | Not classified for male reproduction | Rat | NOAEL 1,000 mg/kg/day | 49 days |
| Hydroxypropyl Methacrylate | Ingestion | Not classified for development | Rat | NOAEL 1,000 mg/kg/day | during gestation |
| Modified Silica | Ingestion | Not classified for female reproduction | Rat | NOAEL 509 mg/kg/day | 1 generation |
| Modified Silica | Ingestion | Not classified for male reproduction | Rat | NOAEL 497 mg/kg/day | 1 generation |
| Modified Silica | Ingestion | Not classified for development | Rat | NOAEL 1,350 mg/kg/day | during organogenesis |
| 2-Hydroxyethyl Methacrylate Phosphate | Ingestion | Not classified for development | Rat | NOAEL 1,000 mg/kg/day | during gestation |
| Phenothiazine | Ingestion | Not classified for development | Rat | NOAEL 150 mg/kg/day | during organogenesis |

Target Organ(s)

Specific Target Organ Toxicity - single exposure

| Name | Route | Target Organ(s) | Value | Species | Test Result | Exposure Duration |
|---------------------------------------|------------|------------------------|--|------------------------|---------------------|-------------------|
| Hydroxypropyl Methacrylate | Inhalation | respiratory irritation | Some positive data exist, but the data are not sufficient for classification | similar health hazards | NOAEL Not available | |
| 2-Hydroxyethyl Methacrylate Phosphate | Inhalation | respiratory irritation | Some positive data exist, but the data are not sufficient for classification | similar health hazards | NOAEL Not available | |

Specific Target Organ Toxicity - repeated exposure

| Name | Route | Target Organ(s) | Value | Species | Test Result | Exposure Duration |
|---------------------------------------|------------|--|--|---------|-----------------------|-----------------------|
| Hydroxypropyl Methacrylate | Inhalation | blood | Not classified | Rat | NOAEL 0.5 mg/l | 21 days |
| Hydroxypropyl Methacrylate | Ingestion | hematopoietic system heart endocrine system liver immune system nervous system kidney and/or bladder | Not classified | Rat | NOAEL 1,000 mg/kg/day | 41 days |
| Modified Silica | Inhalation | respiratory system silicosis | Not classified | Human | NOAEL Not available | occupational exposure |
| 2-Hydroxyethyl Methacrylate Phosphate | Ingestion | hematopoietic system kidney and/or bladder heart liver immune system eyes | Not classified | Rat | NOAEL 300 mg/kg/day | 90 days |
| Phenothiazine | Ingestion | hematopoietic system | May cause damage to organs though prolonged or repeated exposure | Dog | NOAEL 18 mg/kg/day | 13 weeks |
| Phenothiazine | Ingestion | heart endocrine system liver | Not classified | Dog | NOAEL 67 mg/kg/day | 13 weeks |

| | | | | | | |
|--|--|--|--|--|--|--|
| | | kidney and/or bladder respiratory system | | | | |
|--|--|--|--|--|--|--|

Aspiration Hazard

For the component/components, either no data are currently available or the data are not sufficient for classification.

Please contact the address or phone number listed on the first page of the SDS for additional toxicological information on this material and/or its components.

SECTION 12: Ecological information

Ecotoxicological information

Please contact the address or phone number listed on the first page of the SDS for additional ecotoxicological information on this material and/or its components.

Chemical fate information

Please contact the address or phone number listed on the first page of the SDS for additional chemical fate information on this material and/or its components.

SECTION 13: Disposal considerations

13.1. Disposal methods

Dispose of contents/ container in accordance with the local/regional/national/international regulations.

Dispose of completely cured (or polymerized) material in a permitted industrial waste facility. As a disposal alternative, incinerate uncured product in a permitted waste incineration facility. Proper destruction may require the use of additional fuel during incineration processes. Combustion products will include halogen acid (HCl/HF/HBr). Facility must be capable of handling halogenated materials. Empty drums/barrels/containers used for transporting and handling hazardous chemicals (chemical substances/mixtures/preparations classified as Hazardous as per applicable regulations) shall be considered, stored, treated & disposed of as hazardous wastes unless otherwise defined by applicable waste regulations. Consult with the respective regulating authorities to determine the available treatment and disposal facilities.

EPA Hazardous Waste Number (RCRA): Not regulated

SECTION 14: Transport Information

For Transport Information, please visit <http://3M.com/Transportinfo> or call 1-800-364-3577 or 651-737-6501.

SECTION 15: Regulatory information

15.1. US Federal Regulations

Contact 3M for more information.

EPCRA 311/312 Hazard Classifications:

| |
|------------------|
| Physical Hazards |
| Not applicable |

| |
|--------------------------------------|
| Health Hazards |
| Respiratory or Skin Sensitization |
| Serious eye damage or eye irritation |

Skin Corrosion or Irritation

Section 313 Toxic Chemicals subject to the reporting requirements of that section and 40 CFR part 372 (EPCRA):

| <u>Ingredient</u> | <u>C.A.S. No</u> | <u>% by Wt</u> |
|---|------------------|----------------|
| Phenoxyethyl Methacrylate (GLYCOL ETHERS) | 10595-06-9 | 10 - 40 |

15.2. State Regulations

Contact 3M for more information.

15.3. Chemical Inventories

The components of this product are in compliance with the chemical notification requirements of TSCA. All required components of this product are listed on the active portion of the TSCA Inventory.

Contact 3M for more information.

15.4. International Regulations

Contact 3M for more information.

This SDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SECTION 16: Other information

NFPA Hazard Classification

Health: 3 Flammability: 1 Instability: 0 Special Hazards: None

National Fire Protection Association (NFPA) hazard ratings are designed for use by emergency response personnel to address the hazards that are presented by short-term, acute exposure to a material under conditions of fire, spill, or similar emergencies. Hazard ratings are primarily based on the inherent physical and toxic properties of the material but also include the toxic properties of combustion or decomposition products that are known to be generated in significant quantities.

| | | | |
|-----------------|-----------|------------------|----------|
| Document Group: | 16-0795-1 | Version Number: | 11.00 |
| Issue Date: | 05/21/18 | Supersedes Date: | 08/09/17 |

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| Document Group: | 11-2664-8 | Version Number: | 21.00 |
| Issue Date: | 05/21/18 | Supersedes Date: | 01/18/18 |

SECTION 1: Identification

1.1. Product identifier

3M™ Scotch-Weld™ Instant Adhesive CA100 Clear

Product Identification Numbers

62-3873-0330-8, 62-3873-0335-7, 62-3873-3830-4

1.2. Recommended use and restrictions on use

Recommended use

Structural Strength Instant Adhesive.

1.3. Supplier's details

| | |
|---------------|---|
| MANUFACTURER: | 3M |
| DIVISION: | Industrial Adhesives and Tapes Division |
| ADDRESS: | 3M Center, St. Paul, MN 55144-1000, USA |
| Telephone: | 1-888-3M HELPS (1-888-364-3577) |

1.4. Emergency telephone number

1-800-364-3577 or (651) 737-6501 (24 hours)

SECTION 2: Hazard identification

2.1. Hazard classification

Flammable Liquid: Category 4.

Serious Eye Damage/Irritation: Category 2A.

Skin Sensitizer: Category 1B.

Specific Target Organ Toxicity (single exposure): Category 2.

Specific Target Organ Toxicity (single exposure): Category 3.

2.2. Label elements

Signal word

Warning

Symbols

Exclamation mark | Health Hazard |

Pictograms



Hazard Statements

Combustible liquid.

Causes serious eye irritation.
May cause an allergic skin reaction.
May cause respiratory irritation.

May cause damage to organs:
nervous system |

Precautionary Statements

Prevention:

Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
Do not breathe dust/fume/gas/mist/vapors/spray.
Use only outdoors or in a well-ventilated area.
Wear protective gloves and eye/face protection.
Do not eat, drink or smoke when using this product.
Wash thoroughly after handling.
Contaminated work clothing must not be allowed out of the workplace.

Response:

IF INHALED: Remove person to fresh air and keep comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If eye irritation persists: Get medical advice/attention.
IF ON SKIN: Wash with plenty of soap and water.
If skin irritation or rash occurs: Get medical advice/attention.
Wash contaminated clothing before reuse.
IF exposed or concerned: Call a POISON CENTER or doctor/physician.
In case of fire: Use a fire fighting agent suitable for flammable liquids such as dry chemical or carbon dioxide to extinguish.

Storage:

Keep cool.
Keep container tightly closed.
Store locked up in a well-ventilated place.

Disposal:

Dispose of contents/container in accordance with applicable local/regional/national/international regulations.

SECTION 3: Composition/information on ingredients

| Ingredient | C.A.S. No. | % by Wt |
|---------------------------|------------|-------------------------|
| ETHYL CYANOACRYLATE | 7085-85-0 | 60 - 100 Trade Secret * |
| POLY(METHYL METHACRYLATE) | 9011-14-7 | 10 - 30 Trade Secret * |
| HYDROQUINONE | 123-31-9 | 0.1 - 1 Trade Secret * |

*The specific chemical identity and/or exact percentage (concentration) of this composition has been withheld as a trade secret.

SECTION 4: First aid measures

4.1. Description of first aid measures

Inhalation:

Remove person to fresh air. If you feel unwell, get medical attention.

Skin Contact:

FOR SKIN BONDS: Quickly soak in warm water and avoid use of excessive force to free bonded area. If unable to free bonded area, or if lips or mouth are bonded, get medical attention. If irritation persists, get medical attention.

Eye Contact:

Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention. DO NOT force eyelids open.

If Swallowed:

Rinse mouth. If you feel unwell, get medical attention.

4.2. Most important symptoms and effects, both acute and delayed

See Section 11.1. Information on toxicological effects.

4.3. Indication of any immediate medical attention and special treatment required

Not applicable

SECTION 5: Fire-fighting measures

5.1. Suitable extinguishing media

In case of fire: Use a fire fighting agent suitable for flammable liquids such as dry chemical or carbon dioxide to extinguish.

5.2. Special hazards arising from the substance or mixture

Closed containers exposed to heat from fire may build pressure and explode.

Hazardous Decomposition or By-Products

| <u>Substance</u> | <u>Condition</u> |
|--------------------|-------------------|
| Carbon monoxide | During Combustion |
| Carbon dioxide | During Combustion |
| Oxides of Nitrogen | During Combustion |

5.3. Special protective actions for fire-fighters

Water may not effectively extinguish fire; however, it should be used to keep fire-exposed containers and surfaces cool and prevent explosive rupture. Wear full protective clothing, including helmet, self-contained, positive pressure or pressure demand breathing apparatus, bunker coat and pants, bands around arms, waist and legs, face mask, and protective covering for exposed areas of the head.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Evacuate area. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Use only non-sparking tools. Ventilate the area with fresh air. For large spill, or spills in confined spaces, provide mechanical ventilation to disperse or exhaust vapors, in accordance with good industrial hygiene practice. Warning! A motor could be an ignition source and

could cause flammable gases or vapors in the spill area to burn or explode. Refer to other sections of this SDS for information regarding physical and health hazards, respiratory protection, ventilation, and personal protective equipment.

6.2. Environmental precautions

Avoid release to the environment.

6.3. Methods and material for containment and cleaning up

Contain spill. Working from around the edges of the spill inward, cover with bentonite, vermiculite, or commercially available inorganic absorbent material. Mix in sufficient absorbent until it appears dry. Remember, adding an absorbent material does not remove a physical, health, or environmental hazard. Collect as much of the spilled material as possible using non-sparking tools. Place in a closed container approved for transportation by appropriate authorities. Clean up residue with an appropriate solvent selected by a qualified and authorized person. Ventilate the area with fresh air. Read and follow safety precautions on the solvent label and SDS. Seal the container. Dispose of collected material as soon as possible in accordance with applicable local/regional/national/international regulations.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

For industrial or professional use only. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Do not breathe dust/fume/gas/mist/vapors/spray. Do not get in eyes, on skin, or on clothing. Do not eat, drink or smoke when using this product. Wash thoroughly after handling. Contaminated work clothing should not be allowed out of the workplace. Avoid release to the environment. Wash contaminated clothing before reuse. Avoid contact with oxidizing agents (eg. chlorine, chromic acid etc.)

7.2. Conditions for safe storage including any incompatibilities

Store in a well-ventilated place. Keep cool. Keep container tightly closed. Store away from acids. Store away from strong bases. Store away from oxidizing agents. Store away from amines.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational exposure limits

If a component is disclosed in section 3 but does not appear in the table below, an occupational exposure limit is not available for the component.

| Ingredient | C.A.S. No. | Agency | Limit type | Additional Comments |
|---------------------|------------|--------|------------------------|---|
| HYDROQUINONE | 123-31-9 | ACGIH | TWA:1 mg/m3 | A3: Confirmed animal carcin., Dermal Sensitizer |
| HYDROQUINONE | 123-31-9 | OSHA | TWA:2 mg/m3 | |
| ETHYL CYANOACRYLATE | 7085-85-0 | ACGIH | TWA:0.2 ppm;STEL:1 ppm | Dermal/Respiratory Sensitizer |

ACGIH : American Conference of Governmental Industrial Hygienists

AIHA : American Industrial Hygiene Association

CMRG : Chemical Manufacturer's Recommended Guidelines

OSHA : United States Department of Labor - Occupational Safety and Health Administration

TWA: Time-Weighted-Average

STEL: Short Term Exposure Limit

CEIL: Ceiling

8.2. Exposure controls

8.2.1. Engineering controls

Use general dilution ventilation and/or local exhaust ventilation to control airborne exposures to below relevant Exposure Limits and/or control dust/fume/gas/mist/vapors/spray. If ventilation is not adequate, use respiratory protection equipment.

8.2.2. Personal protective equipment (PPE)

Eye/face protection

Select and use eye/face protection to prevent contact based on the results of an exposure assessment. The following eye/face protection(s) are recommended:

Indirect Vented Goggles

Skin/hand protection

Select and use gloves and/or protective clothing approved to relevant local standards to prevent skin contact based on the results of an exposure assessment. Selection should be based on use factors such as exposure levels, concentration of the substance or mixture, frequency and duration, physical challenges such as temperature extremes, and other use conditions. Consult with your glove and/or protective clothing manufacturer for selection of appropriate compatible gloves/protective clothing. Do not wear cotton gloves.

Gloves made from the following material(s) are recommended: Neoprene

Nitrile Rubber

Natural Rubber

Respiratory protection

An exposure assessment may be needed to decide if a respirator is required. If a respirator is needed, use respirators as part of a full respiratory protection program. Based on the results of the exposure assessment, select from the following respirator type(s) to reduce inhalation exposure:

Half facepiece or full facepiece air-purifying respirator suitable for organic vapors and particulates

For questions about suitability for a specific application, consult with your respirator manufacturer.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

| | |
|---|---|
| General Physical Form: | Liquid |
| Specific Physical Form: | Viscous Liquid |
| Odor, Color, Grade: | Clear, colorless, sharp irritating odor |
| Odor threshold | <i>No Data Available</i> |
| pH | <i>Not Applicable</i> |
| Melting point | <i>Not Applicable</i> |
| Boiling Point | > 210 °F [@ 6 mmHg] |
| Flash Point | 185 °F [<i>Test Method: Tagliabue Closed Cup</i>] |
| Evaporation rate | Negligible |
| Flammability (solid, gas) | Not Applicable |
| Flammable Limits(LEL) | <i>No Data Available</i> |
| Flammable Limits(UEL) | <i>No Data Available</i> |
| Vapor Pressure | 1.0 mmHg [@ 20 °C] |
| Vapor Density | <i>No Data Available</i> |
| Density | 1.05 g/ml |
| Specific Gravity | 1.05 [<i>Ref Std: WATER=1</i>] |
| Solubility in Water | Nil |
| Solubility- non-water | <i>No Data Available</i> |
| Partition coefficient: n-octanol/ water | <i>No Data Available</i> |
| Autoignition temperature | <i>No Data Available</i> |
| Decomposition temperature | <i>No Data Available</i> |
| Viscosity | 2,500 - 4,500 centipoise |
| Hazardous Air Pollutants | ≤1.0 % weight [<i>Test Method: Calculated</i>] |
| VOC Less H ₂ O & Exempt Solvents | ≤ 6 g/l |
| VOC Less H ₂ O & Exempt Solvents | ≤ 0.6 % |

SECTION 10: Stability and reactivity

10.1. Reactivity

This material may be reactive with certain agents under certain conditions - see the remaining headings in this section.

10.2. Chemical stability

Stable.

10.3. Possibility of hazardous reactions

Hazardous polymerization may occur. May occur in large quantities only.

10.4. Conditions to avoid

None known.

10.5. Incompatible materials

Strong bases

Amines

10.6. Hazardous decomposition products

Substance

Condition

None known.

Refer to section 5.2 for hazardous decomposition products during combustion.

SECTION 11: Toxicological information

The information below may not be consistent with the material classification in Section 2 if specific ingredient classifications are mandated by a competent authority. In addition, toxicological data on ingredients may not be reflected in the material classification and/or the signs and symptoms of exposure, because an ingredient may be present below the threshold for labeling, an ingredient may not be available for exposure, or the data may not be relevant to the material as a whole.

11.1. Information on Toxicological effects

Signs and Symptoms of Exposure

Based on test data and/or information on the components, this material may produce the following health effects:

Inhalation:

Respiratory Tract Irritation: Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain.

Skin Contact:

Bonds skin rapidly.

Mild Skin Irritation: Signs/symptoms may include localized redness, swelling, itching, and dryness. Allergic Skin Reaction (non-photo induced): Signs/symptoms may include redness, swelling, blistering, and itching.

May cause additional health effects (see below). Contact through clothing may cause thermal burns.

Eye Contact:

Bonds eyelids rapidly.

Severe Eye Irritation: Signs/symptoms may include significant redness, swelling, pain, tearing, cloudy appearance of the cornea, and impaired vision.

Ingestion:

Gastrointestinal Irritation: Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

May cause additional health effects (see below).

Additional Health Effects:

Single exposure may cause target organ effects:

Dermal Effects: Signs/symptoms may include changes in skin pigmentation and/or coloration.

Neurological Effects: Signs/symptoms may include personality changes, lack of coordination, sensory loss, tingling or numbness of the extremities, weakness, tremors, and/or changes in blood pressure and heart rate.

Toxicological Data

If a component is disclosed in section 3 but does not appear in a table below, either no data are available for that endpoint or the data are not sufficient for classification.

Acute Toxicity

| Name | Route | Species | Value |
|---------------------------|-----------|---------|--|
| Overall product | Ingestion | | No data available; calculated ATE >5,000 mg/kg |
| ETHYL CYANOACRYLATE | Dermal | Rabbit | LD50 > 2,000 mg/kg |
| ETHYL CYANOACRYLATE | Ingestion | Rat | LD50 > 5,000 mg/kg |
| POLY(METHYL METHACRYLATE) | Dermal | | LD50 estimated to be > 5,000 mg/kg |
| POLY(METHYL METHACRYLATE) | Ingestion | Rat | LD50 > 5,000 mg/kg |
| HYDROQUINONE | Dermal | Rat | LD50 > 4,800 mg/kg |
| HYDROQUINONE | Ingestion | Rat | LD50 302 mg/kg |

ATE = acute toxicity estimate

Skin Corrosion/Irritation

| Name | Species | Value |
|---------------------------|------------------|---------------------------|
| ETHYL CYANOACRYLATE | Rabbit | Mild irritant |
| POLY(METHYL METHACRYLATE) | Rabbit | No significant irritation |
| HYDROQUINONE | Human and animal | Minimal irritation |

Serious Eye Damage/Irritation

| Name | Species | Value |
|---------------------------|---------|-----------------|
| ETHYL CYANOACRYLATE | Rabbit | Severe irritant |
| POLY(METHYL METHACRYLATE) | Rabbit | Mild irritant |
| HYDROQUINONE | Human | Corrosive |

Skin Sensitization

| Name | Species | Value |
|---------------------|------------|----------------|
| ETHYL CYANOACRYLATE | Human | Not classified |
| HYDROQUINONE | Guinea pig | Sensitizing |

Respiratory Sensitization

| Name | Species | Value |
|------|---------|-------|
|------|---------|-------|

| | | |
|---------------------|-------|----------------|
| ETHYL CYANOACRYLATE | Human | Not classified |
|---------------------|-------|----------------|

Germ Cell Mutagenicity

| Name | Route | Value |
|---------------------|----------|--|
| ETHYL CYANOACRYLATE | In Vitro | Not mutagenic |
| HYDROQUINONE | In Vitro | Some positive data exist, but the data are not sufficient for classification |
| HYDROQUINONE | In vivo | Some positive data exist, but the data are not sufficient for classification |

Carcinogenicity

| Name | Route | Species | Value |
|--------------|-----------|-------------------------|--|
| HYDROQUINONE | Dermal | Mouse | Not carcinogenic |
| HYDROQUINONE | Ingestion | Multiple animal species | Some positive data exist, but the data are not sufficient for classification |

Reproductive Toxicity

Reproductive and/or Developmental Effects

| Name | Route | Value | Species | Test Result | Exposure Duration |
|--------------|-----------|--|---------|---------------------|----------------------|
| HYDROQUINONE | Ingestion | Not classified for female reproduction | Rat | NOAEL 150 mg/kg/day | 2 generation |
| HYDROQUINONE | Ingestion | Not classified for male reproduction | Rat | NOAEL 150 mg/kg/day | 2 generation |
| HYDROQUINONE | Ingestion | Not classified for development | Rat | NOAEL 100 mg/kg/day | during organogenesis |

Target Organ(s)

Specific Target Organ Toxicity - single exposure

| Name | Route | Target Organ(s) | Value | Species | Test Result | Exposure Duration |
|---------------------|------------|------------------------|----------------------------------|---------|---------------------|-----------------------|
| ETHYL CYANOACRYLATE | Inhalation | respiratory irritation | May cause respiratory irritation | Human | NOAEL Not available | occupational exposure |
| HYDROQUINONE | Ingestion | nervous system | May cause damage to organs | Rat | NOAEL Not available | not applicable |
| HYDROQUINONE | Ingestion | kidney and/or bladder | Not classified | Rat | NOAEL 400 mg/kg | not applicable |

Specific Target Organ Toxicity - repeated exposure

| Name | Route | Target Organ(s) | Value | Species | Test Result | Exposure Duration |
|--------------|-----------|-----------------------|----------------|---------|---------------------|-----------------------|
| HYDROQUINONE | Ingestion | blood | Not classified | Rat | NOAEL Not available | 40 days |
| HYDROQUINONE | Ingestion | bone marrow liver | Not classified | Rat | NOAEL Not available | 9 weeks |
| HYDROQUINONE | Ingestion | kidney and/or bladder | Not classified | Rat | LOAEL 50 mg/kg/day | 15 months |
| HYDROQUINONE | Ocular | eyes | Not classified | Human | NOAEL Not available | occupational exposure |

Aspiration Hazard

For the component/components, either no data are currently available or the data are not sufficient for classification.

Please contact the address or phone number listed on the first page of the SDS for additional toxicological information on this material and/or its components.

SECTION 12: Ecological information

Ecotoxicological information

Please contact the address or phone number listed on the first page of the SDS for additional ecotoxicological information on this material and/or its components.

Chemical fate information

Please contact the address or phone number listed on the first page of the SDS for additional chemical fate information on this material and/or its components.

SECTION 13: Disposal considerations

13.1. Disposal methods

Dispose of contents/ container in accordance with the local/regional/national/international regulations.

Dispose of completely cured (or polymerized) material in a permitted industrial waste facility. As a disposal alternative, incinerate uncured product in a permitted waste incineration facility. Proper destruction may require the use of additional fuel during incineration processes. Empty drums/barrels/containers used for transporting and handling hazardous chemicals (chemical substances/mixtures/preparations classified as Hazardous as per applicable regulations) shall be considered, stored, treated & disposed of as hazardous wastes unless otherwise defined by applicable waste regulations. Consult with the respective regulating authorities to determine the available treatment and disposal facilities.

EPA Hazardous Waste Number (RCRA): Not regulated

SECTION 14: Transport Information

For Transport Information, please visit <http://3M.com/Transportinfo> or call 1-800-364-3577 or 651-737-6501.

SECTION 15: Regulatory information

15.1. US Federal Regulations

Contact 3M for more information.

EPCRA 311/312 Hazard Classifications:

Physical Hazards

Flammable (gases, aerosols, liquids, or solids)

Health Hazards

Respiratory or Skin Sensitization

Serious eye damage or eye irritation

Specific target organ toxicity (single or repeated exposure)

Section 313 Toxic Chemicals subject to the reporting requirements of that section and 40 CFR part 372 (EPCRA):

| <u>Ingredient</u> | <u>C.A.S. No</u> | <u>% by Wt</u> |
|-------------------|------------------|----------------------|
| HYDROQUINONE | 123-31-9 | Trade Secret 0.1 - 1 |

15.2. State Regulations

Contact 3M for more information.

15.3. Chemical Inventories

The components of this product are in compliance with the chemical notification requirements of TSCA. All required components of this product are listed on the active portion of the TSCA Inventory.

Contact 3M for more information.

15.4. International Regulations

Contact 3M for more information.

This SDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SECTION 16: Other information

NFPA Hazard Classification

Health: 2 Flammability: 2 Instability: 1 Special Hazards: None

National Fire Protection Association (NFPA) hazard ratings are designed for use by emergency response personnel to address the hazards that are presented by short-term, acute exposure to a material under conditions of fire, spill, or similar emergencies. Hazard ratings are primarily based on the inherent physical and toxic properties of the material but also include the toxic properties of combustion or decomposition products that are known to be generated in significant quantities.

| | | | |
|------------------------|-----------|-------------------------|----------|
| Document Group: | 11-2664-8 | Version Number: | 21.00 |
| Issue Date: | 05/21/18 | Supersedes Date: | 01/18/18 |

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TECHNICAL DATA SHEET



Plastics Bonding System

Description: Loctite Plastics Bonding System is a two-part cyanoacrylate adhesive system that sets in seconds and develops tremendous strength with just one drop. The activator primes hard-to-bond surfaces such as polypropylene and polyethylene. No mixing required; simply prime and glue. Loctite Plastics Bonding System dries clear and sets without clamping. It is resistant to water, most chemicals and freezing temperatures.

Available As:

| Item # | Size | Package |
|--------|------------------------------------|---------|
| 681925 | Activator = 4 ml Adhesive = 2 g | Carded |

Features & Benefits:

- Bonds Difficult to Bond Plastics such as Polyethylene, Polypropylene and PTFE/Teflon®
- Sets in Seconds
- No Mixing Required
- Dries Transparent

Recommended For:

Use for repairing figurines, costume jewelry, cameras, toys, metal car parts, wiper blades, rubber seals and O-rings. Bonds leather, cork, paper, cardboard, wood, chipboard, fabric, metal, ceramic, many rubbers and plastics such as Plexiglas®, polycarbonate, polystyrene, PVC, polyethylene, polypropylene and polytetrafluoroethylene (PTFE)/Teflon®.

For Best Results:

- Do not use polystyrene foam, foam rubber, pure bone china, glass or silicone rubber
- Bonded items should not be placed in oven or microwave
- Not suitable for bonding assemblies which will hold hot liquids
- Do not use on glazed surfaces
- Not suitable for exterior applications
- Not suitable for repairs needing high flexibility or for gap-filling applications



TECHNICAL DATA SHEET

Typical Uncured Physical Properties:

| | | |
|--------------------------------|---|-------------------------------------|
| Color: | Clear and Colorless | |
| Appearance: | Liquid | |
| Adhesive Base: | Ethyl cyanoacrylate | |
| Activator Solvent: | Heptane | |
| Odor: | Solvent (use in well-ventilated area) | |
| Specific Gravity: | Adhesive: 1.05 Activator: 0.684 | |
| Flash Point: | Adhesive: 176°F (80°C) to 200°F (93.4°C) Activator: 30.2°F (-1.00°C) | |
| VOC Content: | < 2 % by weight < 20 g/l | CARB SCAQMD rule 1168 |
| Shelf Life: | From date of manufacture (unopened) : 30 months 18 months | Stored at 36-46°F Stored at 68°F |
| Lot Code Explanation: | #YDDDX | |
| Printed on crimped end on tube | # = Disregard Y = Last digit of year of manufacture DDD = Day of manufacture based on 365 days in a year X = Disregard Example: 6061 = 61 st day of 2016 = March 2, 2016 | |

Typical Application Properties:

| | | |
|--------------------------|--|--|
| Application Temperature: | Apply above 50°F (10°C) | |
| Fixture Time: | 30 seconds* | |
| Handling Time: | Leave undisturbed for at least 10 minutes. For best results, allow full bond strength to develop overnight before handling. | |
| Cure Time: | 12 to 24 hours* *Times are dependent on temperature, humidity, porosity of surface bonded and amount of adhesive used | |

Typical Cured Performance Properties:

| | | |
|-------------------------|--|--|
| Color: | Clear and Colorless | |
| Cured Form: | Non-flammable, brittle solid | |
| Service Temperature: | Up to 180°F (82°C) | |
| Moisture Resistant: | Yes | |
| Tensile Shear Strength: | Varies from 290-2900 psi (2-20 N/mm ²) | ISO 4587 |
| Aluminum: | 2248 psi (15.5 N/mm ²) | 12-24 hours cure, depending on the substrate |
| Chemical Resistance: | Motor oil, leaded petrol, ethanol, isopropanol and Freon® TA | |

Directions:

Tools Typically Required:
Tissue paper

Safety Precautions:
Use in a well-ventilated area. Protect work area. Wash hands after use.

Preparation:
Surfaces to be bonded must be close fitting, clean, dry and free from oil, wax and paint. Protect work area. For best results, lightly roughen smooth surfaces. Pre-fit parts to be joined.

Application:
To open the adhesive tube: Screw the cap and nozzle clockwise all the way down to tube shoulder, puncturing the tube. Unscrew the cap counter clockwise from the nozzle.



TECHNICAL DATA SHEET

To open the activator: Pull top off black base, exposing felt tip applicator. Note: The activator is only recommended for difficult to bond substrates such as polyethylene, polypropylene, polytetrafluoroethylene (PTFE) and thermoplastic rubber materials. Other substrates do not require activator.

Apply the surface activator to both surfaces (see note above). Wait 60 seconds for the activator to completely dry. Apply the adhesive sparingly to one side only using approximately one drop per square inch of surface. Press parts together immediately. Hold in place for 30 seconds or until bond sets. Do not reposition parts. Clean tip with tissue and replace the cap.

Clean-up:

After cleaning, wet any tissue used for wiping off glue with water and dispose of. When cleaning up larger quantities of uncured adhesive, apply water and allow to cure and then scrape up. Note this may result in damage to the surfaces. Cured adhesive may be cut away with caution using a sharp blade, removed with acetone or with boiling water. Note: Acetone may damage some plastics and is also highly flammable. Test before use and follow manufacturer's instructions.

Storage & Disposal:

Not damaged by freezing in the unopened container. Optimal shelf life is achieved when unopened container is stored from 36°F to 46°F (2°C to 8°C). After opening, it is not recommended that the product be stored cold or frozen. Once opened, the product is best stored tightly sealed in a dry location away from heat sources or sun exposure. Humidity and high temperatures may decrease shelf life. Use an approved hazardous waste facility for disposal.

Label Precautions:

WARNING! This kit contains the chemicals ethyl cyanoacrylate and heptane which may be harmful if misused.

Bonder: WARNING! EYE, SKIN AND RESPIRATORY IRRITANT. BONDS SKIN IN SECONDS. Contains Cyanoacrylate. May cause allergic skin reaction. Skin contact may cause burns. Avoid contact with skin and eyes. **FIRST AID:** In case of eye contact, flush with water for 15 minutes, call a physician. For skin contact, flush with water. For ingestion do not induce vomiting, call a physician.

Activator: WARNING! May be flammable. Keep away from heat and open flame. This activator contains a heptane soaked wad and marking tip but no free liquid. Vapor may be harmful. May irritate eyes and skin on contact. **FIRST AID:** In case of eye contact, flush with water for 15 minutes, call a physician. For skin contact, flush thoroughly with soap and water. If irritation persists, call a physician. **KEEP OUT OF THE REACH OF CHILDREN.**

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Refer to Safety Data Sheet (SDS) for further information.

Disclaimer:

The information and recommendations contained herein are based on our research and are believed to be accurate, but no warranty, express or implied, is made or should be inferred. Purchasers should test the products to determine acceptable quality and suitability for their own intended use. Nothing contained herein shall be construed to imply the nonexistence of any relevant patents or to constitute a permission, inducement or recommendation to practice any invention covered by any patent, without authority from the owner of the patent.



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Henkel Corporation - Professional & Consumer Adhesives Headquarters - Rocky Hill, CT 06067

www.henkelna.com

Revision Date: 08/26/2016 Supersedes: 03/05/2014 Ref. #: 158401/178308 Bulk #: 252018



HDPE (Quadrant EPP)

High Density Polyethylene

| Physical Properties | Metric | English | Comments |
|--------------------------------|------------|--------------------------|-------------------------------|
| Specific Gravity | 0.94 g/cc | 0.034 lb/in ³ | ASTM D792 |
| Water Absorption | Max 0.01 % | Max 0.01 % | Immersion, 24hr; ASTM D570(2) |
| Water Absorption at Saturation | Max 0.01 % | Max 0.01 % | Immersion; ASTM D570(2) |

Mechanical Properties

| | | | |
|----------------------------|------------------------|--------------------------|---|
| Hardness, Shore D | 67 | 67 | ASTM D2240 |
| Tensile Strength, Ultimate | 32.4 MPa | 4700 psi | ASTM D638 |
| Elongation at Break | 200 % | 200 % | ASTM D638 |
| Tensile Modulus | 0.565 GPa | 82 ksi | ASTM D638 |
| Flexural Modulus | 0.607 GPa | 88 ksi | ASTM D790 |
| Flexural Yield Strength | 23.4 MPa | 3400 psi | ASTM D790 |
| Compressive Strength | 19.3 MPa | 2800 psi | 10% Def., 73°F; ASTM D695 |
| Compressive Modulus | 0.452 GPa | 65.5 ksi | ASTM D695 |
| Shear Strength | 62.1 MPa | 9000 psi | ASTM D732 |
| Coefficient of Friction | 0.08 | 0.08 | Dry vs. Steel; QTM 55007 |
| Limiting Pressure Velocity | 0.0701 MPa-m/sec | 2000 psi-ft/min | QTM 55007 |
| Abrasion | 130 | 130 | Sand Wheel; TIVAR® 1000 = 100; ASTM G-65 |
| Abrasion | 15 | 15 | Sand Slurry; 1018 Steel = 100; ASTM D4020 |
| Izod Impact Resistance | 73.5 kJ/m ² | 35 ft-lb/in ² | ASTM D4020 |

Electrical Properties

| | | | |
|--------------------------------|---------------------|---------------------|------------------|
| Surface Resistivity per Square | 1e+013 - 1e+015 ohm | 1e+013 - 1e+015 ohm | EOS/ESD S11.11 |
| Dielectric Constant | 2.3 | 2.3 | 1 MHz; ASTM D150 |
| Dissipation Factor | Max 0.005 | Max 0.005 | 1 MHz; ASTM D150 |

Thermal Properties

| | | | |
|---|-------------|---------------|------------------------------|
| CTE, linear 68°F | 234 µm/m-°C | 130 µin/in-°F | (-40°F to 300°F); ASTM E831 |
| Melting Point | 135 °C | 275 °F | Crystalline Peak; ASTM D3418 |
| Maximum Service Temperature, Air | 82.2 °C | 180 °F | Continuous |
| Deflection Temperature at 1.8 MPa (264 psi) | 46.7 °C | 116 °F | ASTM D648 |
| Flammability, UL94 (Estimated Rating) | HB | HB | 3.1 mm (1/8 in.) |

All statements, technical information and recommendations contained in this database are presented in good faith, based upon tests believed to be reliable and practical field experience. The reader is cautioned, however, that Quadrant EPP and Automation Creations, Inc. cannot guarantee the accuracy or completeness of this information, and it is the customer's responsibility to determine the suitability of Quadrant EPP's products in any given application.



LDPE (Quadrant)

Natural Low Density Polyethylene

| Physical Properties | Metric | English | Comments |
|--------------------------------|------------|---------------------------|-------------------------------|
| Specific Gravity | 0.92 g/cc | 0.0332 lb/in ³ | ASTM D792 |
| Water Absorption | Max 0.01 % | Max 0.01 % | Immersion, 24hr; ASTM D570(2) |
| Water Absorption at Saturation | Max 0.01 % | Max 0.01 % | Immersion; ASTM D570(2) |

Mechanical Properties

| | | | |
|----------------------------|-----------|----------|---------------------------|
| Hardness, Shore D | 45 | 45 | ASTM D2240 |
| Tensile Strength, Ultimate | 11.7 MPa | 1700 psi | ASTM D638 |
| Elongation at Break | 400 % | 400 % | ASTM D638 |
| Tensile Modulus | 0.393 GPa | 57 ksi | ASTM D638 |
| Flexural Modulus | 0.2 GPa | 29 ksi | ASTM D790 |
| Flexural Yield Strength | 10.3 MPa | 1500 psi | ASTM D790 |
| Compressive Strength | 9.65 MPa | 1400 psi | 10% Def., 73°F; ASTM D695 |
| Compressive Modulus | 0.393 GPa | 57 ksi | ASTM D695 |
| Izod Impact, Notched | NB | NB | ASTM D256 Type A |

Electrical Properties

| | | | |
|--------------------------------|----------------|----------------|-----------|
| Surface Resistivity per Square | Min 1e+015 ohm | Min 1e+015 ohm | ASTM D257 |
|--------------------------------|----------------|----------------|-----------|

Thermal Properties

| | | | |
|---------------------------------------|---------|--------|-------------------------------|
| Melting Point | 110 °C | 230 °F | Crystalline, Peak; ASTM D3418 |
| Maximum Service Temperature, Air | 71.1 °C | 160 °F | Long Term |
| Flammability, UL94 (Estimated Rating) | HB | HB | 1/8 inch |

Qualitative Processing Properties

| | | |
|-----------------------------------|--------------|---------------------------|
| Compliance - FDA | Compliant | |
| Machinability | 3 | 1-10, 1=Easier to Machine |
| Service in Alcohols | Unacceptable | |
| Service in Aliphatic Hydrocarbons | Unacceptable | |
| Service in Aromatic Hydrocarbons | Unacceptable | |
| Service in Chlorinated Solvents | Unacceptable | |
| Service in Ethers | Unacceptable | |
| Service in Ketones | Unacceptable | |
| Service in Strong Acids | Unacceptable | |
| Service in Strong Alkalies | Unacceptable | |
| Service in Sunlight | Unacceptable | |
| Service in Weak Acids | Unacceptable | |
| Service in Weak Alkalies | Unacceptable | |

All statements, technical information and recommendations contained in this database are presented in good faith, based upon tests believed to be reliable and practical field experience. The reader is cautioned, however, that Quadrant EPP and Automation Creations, Inc. cannot guarantee the accuracy or completeness of this information, and it is the customer's responsibility to determine the suitability of Quadrant EPP's products in any given application.



Safety Data Sheet (SDS) SDS-108-Polyethylene Terephthalate

SECTION 1: PRODUCT AND COMPANY INFORMATION

Product Family: Polymer
Trade Names: PET - Polyethylene Terephthalate - Polyester **Other Means of Identification:** CAS# 25038-59-9
Recommended Uses: Multiple uses such as thread in apparel and home furnishings, reinforcements in tires and conveyer belts.

Emergency Phone Number
 for Spill, Leak, Fire, Exposure, or Accident
 Call CHEMTREC Day or Night
 1-800-424-9300 / +1 703-527-3887 CCN702922

SECTION 2: HAZARD IDENTIFICATION

| EMERGENCY OVERVIEW | | | |
|----------------------------|------------------------------|------------------------|---------------|
| GHS CLASSIFICATION | Non-hazardous | HMIS | |
| Physical State | Solid | HEALTH | 0 |
| Color | Typically clear or off-white | FLAMMABILITY | 1 |
| Odor | Waxy, mild | PHYSICAL HAZARD | 0 |
| PERSONAL PROTECTION | | | See Section 8 |

| | |
|--|---|
| Primary Routes of Exposure | Eyes or skin contact |
| Potential Health Effects | |
| Acute Effects | |
| Inhalation | Health injuries not expected. Not a probable route of exposure under ordinary conditions. |
| Skin contact | Health injuries not expected. Possible mechanical irritation. |
| Eye contact | Health injuries not expected. Possible mechanical irritation from dust or powder. |
| Ingestion | Health injuries not expected. Not a probable route of exposure. |
| Chronic effects | Ongoing exposure may aggravate acute effects |
| Carcinogenicity | See Section 11 |
| Medical conditions aggravated by long term exposure | Ongoing exposure may aggravate acute effects . |

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

| | | |
|-----------------------------|--------------------|--------------------|
| Component: | CAS Number: | Percentage: |
| Polyethylene Terephthalate) | 25038-59-9 | 100 (+/-) |

SECTION 4: FIRST AID MEASURES

Skin Contact: If in contact with solid material, wash with soap and water. If in contact with molten material, submerge injured area in cold water. Do not attempt to remove material adhering to the skin. Get medical attention if irritation develops or persists.
Eye Contact: Flush eyes with plenty of water. Get medical attention if irritation develops or persists.
Inhalation: This material is not likely to be hazardous by inhalation. Consult a physician if symptoms develop or persist.
Ingestion: Not a probable route of exposure.

SECTION 5: FIRE FIGHTING MEASURES

Use water fog, dry chemical, carbon dioxide or foam as appropriate for materials in surrounding fire. Avoid using direct streams of water on molten burning material as it may scatter and spread the fire. Melts in proximity to fires resulting in slippery floors and stairs. Static charges on or powders or powders in liquids may ignite combustible atmospheres. Airborne dusts of this product in an enclosed space and in the presence of an ignition source may constitute an explosion hazard. See NFPA Bulletin 654, "Standard for the Prevention of Fire and Dust Explosions from the Manufacturing Processing, and Handling of Combustible Particulate Solids," for safe handling procedures. As in any fire, wear NIOSH/MSHA approved positive pressure self-contained breathing apparatus and full protective clothing. Watch footing on floors and stairs because of possible spreading of molten material.



Safety Data Sheet (SDS) SDS-108-Polyethylene Terephthalate

SECTION 6: ACCIDENTAL RELEASE MEASURES

Refer to Section 8: Exposure Control and Personal Protection

Emergency Action:

No special environmental precautions required.

Spill/Leak Procedure:

Containment of this material should not be necessary. Sweep up or gather material and place in appropriate container for disposal.

SECTION 7: HANDLING AND STORAGE

Refer to Section 8: Exposure Control and Personal Protection

Handling:

Keep away from heat, flame and strong oxidizing agents.

Storage:

Keep away from heat, sparks, and flame. Store in a cool place in original container and protect from sunlight.

SECTION 8: EXPOSURE CONTROL AND PERSONAL PROTECTION

Engineering Controls:

Use recommended safe handling practices to minimize unnecessary exposure. General room ventilation is adequate for storage and ordinary handling. Use local exhaust at points of fume generation or if dusty conditions prevail.

Personal Protective Equipment:

Wear safety glasses with side shields or chemical goggles to prevent eye contact. Have eye-washing facilities readily available where eye contact can occur. Do not wear contact lenses when working with this substance. Wear impervious gloves and protective clothing to prevent skin contact. Use NIOSH or MSHA approved equipment.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

| | | | |
|---|----------------|-----------------------------------|------------------------------|
| Boiling Point: | Not determined | Vapor Density (Air = 1): | Not applicable |
| Specific Gravity (@ 23°C): | 1.1 | Soluble (% in Water): | Negligible |
| Melting Point: | 165 °C | Appearance: | Solid |
| Evaporation Rate: | Not applicable | Odor: | Characteristic waxy |
| Vapor Pressure: | Not applicable | pH: | Not applicable |
| Odor Threshold: | Not determined | Auto Ignition Temperature: | Not determined) |
| Solubility in water: | Negligible | Viscosity (SUS @ 100°F): | Not applicable |
| Decomposition Temperature: | Not determined | Flash Point: | Not determined |
| Flammability Limits in Air (% by Volume) | | Lower: Not applicable | Upper: Not applicable |

SECTION 10: STABILITY AND REACTIVITY

Reactivity:

Not reactive under normal conditions of storage and use.

Chemical Stability:

Stable under normal conditions of storage and use. Avoid exposure to open flame or exceeding recommended processing conditions.

Stability/Incompatibility:

Avoid contact with strong oxidizers, strong acids or flammable materials.

Conditions to Avoid:

Avoid dust-air mixtures or static charge buildup. Avoid contact with incompatible materials such as oxidizing agents or amines.

Hazardous Reactions/Decomposition Products:

Material does not decompose at ambient temperatures. Combustion or high heat may produce thermal decomposition products that may include carbon monoxide, carbon dioxide, dense smoke, and other toxic vapors.

SECTION 11: TOXICOLOGICAL INFORMATION

Likely Routes of Exposure:

Eyes and skin contact.

Acute Effects:

Mechanical irritation of eyes and skin.

Oral Toxicity LD50 Not Available;

Inhalation Toxicity LD50 Not Available.

Chronic Effects:

None known.

Symptoms:

Irritation of eyes and skin.

Carcinogenicity:

This product has not been found to be carcinogenic by the NTP, ACGIH, IARC or OSHA.

Further information

This product has no known adverse effect on human health.



Safety Data Sheet (SDS) SDS-108-Polyethylene Terephthalate

SECTION 12: ECOLOGICAL INFORMATION

| | |
|-----------------------------------|----------------------------------|
| Ecotoxicity: | No known or expected ecotoxicity |
| Persistence and Biodegradability: | Not determined. |
| Bioaccumulative Potential: | Not determined. |
| Mobility in Soil: | Not determined |

SECTION 13: DISPOSAL CONSIDERATION

Dispose of this product in compliance with all applicable federal, state and local regulations. The unused product is not specifically listed by EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP).

SECTION 14: TRANSPORT INFORMATION

Refer to Section 6: Accidental Release Measures

| | |
|---------------------------------|---------------|
| D.O.T. 49 CFR 172.101: | Not regulated |
| TDG: | Not regulated |
| UN Proper Shipping Name/Number: | Not regulated |
| IMDG: | Not regulated |
| IATA: | Not regulated |

SECTION 15: REGULATORY INFORMATION

SARA TITLE III Information:

Hazard categories for the Superfund Amendments and Reauthorization Act (SARA) Section 311/312/313 (40 CFR 370):

Immediate Hazard: No Delayed Hazard: No Fire Hazard: No Pressure Hazard: No Reactivity Hazard: No

SECTION 16: OTHER INFORMATION

Notice: The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet; however, no warranty or representation, expressed or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices, or from any hazards inherent in the nature of the product.

(Prepared By: Mg-Help)

Revision: New

Issue Date: 02.10.14)

1) PRODUCT AND COMPANY IDENTIFICATION

Company: Videolar S.A.
 Address : 1616, Avenue Abiurana, Industrial District - Manaus-AM. IL: 69075-010
 Telephone : (+55 0XX92) - 2101 - 7800
 Emergency Telephone: (+55 0XX92) - 2101 - 7811 Fax: (+55 XX92) - 2101 - 7814

2) COMPOSITION AND INFORMATION ON INGREDIENTS

Chemical Name: Polystyrene
 Chemical Formula: (C₈H₈)_n
 Synonym: General Purpose Polystyrene, GPPS
 CAS#: 9003-53-6

3) HAZARDS IDENTIFICATION

Physical State and appearance: Solid. Transparent Pellets

Emergency Overview: Irritating vapors to respiratory system and eyes may form when polymer is processed at high temperatures. Molten or heated material in skin contact can cause severe burns.

Routes of Entry: FOR HOT MATERIAL: Skin contact. Eye contact. Inhalation

Eyes: This product is not known to cause eye irritation. However, as with any chemical, some sensitive individuals may experience eye irritation upon contact.

Heated Polymer: Eye contact can cause serious thermal burns.

Vapors formed when polymer is heated may be irritating to the eye.

Skin: No know acute effects of this product resulting from skin contact. However, in light of good industrial hygiene, exposure to any chemical should be kept to a minimum.

Heated Polymer: Eye contact can cause serious thermal burns.

Inhalation: Negligible hazard at room temperature. Nuisance dusts can be irritation to the upper respiratory tract. Irritation vapors may form when polymer is processed at high temperatures.

| | | | | |
|--|--|--|--------------------------------------|---------------------|
| Elaboration: Irnaldo Lopes da Costa | Section: Quality Control Laboratory | Revision: Adriane Ferreira da Silva | Approval: Helton dos Reis Barbosa | Date: 11.09.2008 |
|--|--|--|--------------------------------------|---------------------|

| | |
|---|--|
| Ingestion | No effects are expected for ingestion of small amounts. |
| Potential Chronic Health Effects | CARCINOGENIC EFFECTS : Classified NONE by NTP, NONE by OSHA. Not classification for human by IARC MUTAGENIC EFFECTS : Not Available. TERATOGENIC EFFECTS : Not Available |
| Medical Conditions Aggravated by Overexposure | There is no known effect from chronic exposure to this product. Repeated or prolonged exposure is not known to aggravate medical condition. |
| Overexposure / Signs / Symptoms | Not available. |

4) FIRST AID MEASURES

| | |
|--------------|---|
| Inhalation | Allow the victim to rest in a well ventilated area. |
| Skin Contact | Polymer: No know EFFECT on skin contact, rinse with water for a few minutes. Heated Polymer: For serious burns from heated polymer, get medical attention. |
| Eye Contact | Rinse with water for a few minutes. Seek medical attention if necessary. |
| Ingestion | No first aid procedures are needed. |

5) FIRE FIGHTING MEASURES

| | |
|--|---|
| Flammability of the Product | May be combustible at high temperature. |
| Auto-ignition Temperature | 427°C (800.6°F) |
| Flash Points | Not available. |
| Flammable Limits | Not available. |
| Products of Combustion | Carbon oxides (CO, CO ₂) and soot. |
| Fire Hazards in Presence of Various Substances | No specific information is available in our database regarding the flammability of this product in presence of various materials. |

| | | | | |
|--|--|--|--------------------------------------|---------------------|
| Elaboration: Irialdo Lopes da Costa | Section: Quality Control Laboratory | Revision: Adriane Ferreira da Silva | Approval: Helton dos Reis Barbosa | Date: 11.09.2008 |
|--|--|--|--------------------------------------|---------------------|

Explosion Hazards in Presence of Various Substances

Risks of explosion of the product in presence of mechanical impact: Not expected.
Risks of explosion of the product in presence of static discharge: Possible.
No specific information is available in our database regarding the product's risks of explosion in the presence of various materials.

**Fire Fighting Media and Instructions
Protective Clothing (Fire)**

Small Fire: Use DRY chemicals, CO₂, water spray, halon or foam.
Large Fire: Use water spray, fog or foam. **DO NOT** use water jet.
Wear MSHA/NIOSH approved self-contained breathing apparatus or equivalent and full protective gear.

Special Remarks on Fire Hazards

Fire may produce irritating gases and dense smoke. Flowing material may produce static discharge, ignition dust accumulations.

Special Remarks on Explosion Hazards

No additional remark.

6) ACCIDENTAL RELEASE MEASURES

Small Spill and Leak

Pellets on the floor could present a serious slipping problem. Good housekeeping must be maintained at all times to avoid this hazard. Sweep, shovel or vacuum material into clean containers.

Large Spill and Leak

Use a shovel to put the material into a convenient waste disposal container. Do not allow any potentially contaminated water with pellets to enter any waterway, sewer or drain.

7) HANDLING AND STORAGE

Handling

Avoid Temperatures of 600°F (316°C) or above. Handling of plastic may form nuisance dust.
Protect personnel. Pneumatic transport of material may produce dust. Use filters in pneumatic transport lines to reduce dust. If dusting is a problem, care should be taken to dissipate potential static electricity build-up. Normal precautions for finely divided powders should be made.

Storage

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

| | | | | |
|--|--|--|--------------------------------------|---------------------|
| Elaboration: Irialdo Lopes da Costa | Section: Quality Control Laboratory | Revision: Adriane Ferreira da Silva | Approval: Helton dos Reis Barbosa | Date: 11.09.2008 |
|--|--|--|--------------------------------------|---------------------|

8) EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|---|--|
| Engineering Controls | Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. |
| | Eyes: Safety Glasses. |
| | Body: Coveralls. |
| Personal Protection | Respiratory: Ventilation is normally required when handling this product at high temperatures. Wear appropriate respirator when ventilation is inadequate. |
| | Hands: Thermally insulated gloves required when handling hot material. |
| | Feet: Safety slip proof shoes in areas where spills or leaks can occur. |
| Personal Protection in Case of a Large Spill | Safety glasses. Gloves. Coveralls. |

9) PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--------------------------------------|-----------------------------|
| Physical State and Appearance | Solid. Transparent Pellets. |
| Molecular Weight | Not available. |
| Molecular Formula | $(-CH(C_6H_5)-CH_2-)_x$ |
| pH (1% Soln/Water) | Not applicable. |
| Boiling/Condensation Point | Not applicable. |
| Melting/Freezing Point | >132.22°C (270°F) |
| Critical Temperature | Not available. |
| Specific Gravity | 1.04 (Water = 1) |
| Vapor Pressure | Not available. |

| | | | | |
|--|--|--|--------------------------------------|---------------------|
| Elaboration: Irialdo Lopes da Costa | Section: Quality Control Laboratory | Revision: Adriane Ferreira da Silva | Approval: Helton dos Reis Barbosa | Date: 11.09.2008 |
|--|--|--|--------------------------------------|---------------------|

| | |
|----------------------------|---|
| Vapor Density | Not available. |
| Volatility | Negligible. |
| Odor Threshold | Not available. |
| Evaporation Rate | Not available. |
| VOC | 0 (%). |
| Viscosity | Not available. |
| LogKow | Not available. |
| Ionicity (in Water) | Not available. |
| Dispersion Properties | Not available. |
| Solubility in Water | Insoluble in Water. |
| Physical Chemical Comments | No additional remark. |
| Exclusivity Limit | Not available. |
| Flash Point | Not available. |
| Auto-ignition Temperature | 420 °C |
| Decomposition Temperature | > 250 °C |
| Odor | Odorless |
| Taste | Not available. |
| Color | Polystyrene is a colorless, transparent, glassy solid or a soft colorless form. |

10) STABILITY AND REACTIVITY

| | |
|---|--|
| Stability and Reactivity | The product is stable. Avoid temperatures of 600 deg F (316 ° C)or above. |
| Conditions of Instability | No additional remark. |
| Incompatibility with Various Substances | Reactive with strong oxidizing agents. |

| | | | | |
|--|--|--|--------------------------------------|---------------------|
| Elaboration: Irialdo Lopes da Costa | Section: Quality Control Laboratory | Revision: Adriane Ferreira da Silva | Approval: Helton dos Reis Barbosa | Date: 11.09.2008 |
|--|--|--|--------------------------------------|---------------------|

Hazardous Decomposition Products

Hazardous decomposition products are carbon monoxide, carbon dioxide, dense smoke and hydrocarbons. Exposure of polystyrene to extremely high temperatures (600 deg F or higher) may cause partial decomposition. Chemicals that may be release include styrene monomer, benzene and other hydrocarbons.

11) TOXICOLOGICAL INFORMATION

| | |
|--|--|
| Toxicity Animals | LD50: Not available. LC50: Not available. |
| Chronic Effects on Humans | Carcinogenic Effects: Classified none by NTP, none by OSHA. 3 (Not classifiable for human) by IARC. |
| Other Toxic Effects on Humans | Not considered to be dangerous for humans according to our database. |
| Special Remarks on Toxicity to Animals | No additional remark. |
| Special Remarks on Chronic Effects on Humans | No additional remark. |
| Special Remarks on Other Toxic Effects on Humans | No additional remark. |

12) ECOLOGICAL INFORMATION

| | |
|---|----------------|
| Ecotoxicity | Not available. |
| BOD5 and COD | Not available. |
| Biodegradable/OECD | Not available. |
| Mobility | Not available. |
| Toxicity of the Products of Biodegradable | Not available. |
| Special Remarks on the Products of Biodegradation | Not available. |

| | | | | |
|--|--|--|--------------------------------------|---------------------|
| Elaboration: Irialdo Lopes da Costa | Section: Quality Control Laboratory | Revision: Adriane Ferreira da Silva | Approval: Helton dos Reis Barbosa | Date: 11.09.2008 |
|--|--|--|--------------------------------------|---------------------|

13) DISPOSAL CONSIDERATIONS

Waste Information Transfer to an approved disposal area in accordance with federal, state and local regulations.

Waste Stream Not available.

Consult your local or regional authorities

14) TRANSPORT INFORMATION

DOT Classification or bulk shipments (non bulk shipments May differ) Not a DOT controlled material (United State)

DOT Proper Shipping Name Not applicable.

UN Number Not Established.

Packaging Group Not available.

USCG Proper Shipping Name Not available.

Marine Pollutant Not available.

Hazards Substances Reportable Quantity Not available.

Special Provisions for Transport Not additional remark.

TDG Classification Not controlled under TDG (Canada).

ADR/RID Classification Not controlled under ADR (Europe).

IMO/IMDG Classification Not controlled under IMDG.

ICAO/IATA Classification Not controlled under IATA.

15) REGULATORY INFORMATION

HCS Classification Not controlled under the HCS (United States).

U.S. Federal Regulations TSCA (Toxic Substance Control Act): This product is listed on the TSCA Inventory.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: No products were found.
SARA 311/312 MSDS distribution - chemical inventory - hazard

| | | | | |
|--|---|---|---|----------------------------|
| Elaboration: Ininaldo Lopes da Costa | Section: Quality Control Laboratory | Revision: Adriane Ferreira da Silva | Approval: Helton dos Reis Barbosa | Date: 11.09.2008 |
|--|---|---|---|----------------------------|

identification: No products were found.

International Regulations
Clean water act (CWA) 307: No products were found.
Clean water act (CWA) 311: No products were found.
Clean air act (CAA) 112 accidental release prevention: No products were found.
Clean air act (CAA) 112 regulated flammable substances: No products were found
Clean air act (CAA) 112 regulated toxic substances: No products were found.

International Regulations

WHMIS (CANADA) Not controlled under WHMIS (Canada)

EINECS Not available

DSCL (EEC) Not controlled under DSCL (Europe)

International Lists No products were found

State Regulations California prop. 65: There are no Proposition 65 chemicals present in our polystyrene resins at levels that would required a warning under the California Safe Drinking Water and Toxic Enforcement Act.

16) OTHER INFORMATION

Label Requirements Irritating vapors to respiratory system and eyes may form when polymer is processed at high temperatures.
Molten or heated material in skin contact can cause severe burns.

References HSDB – Hazardous Substances Data Bank.
RTECS – Registry of Toxic Effects of Chemicals Substances

Other Special Considerations This MSDS covers all Polystyrene grades made by Videolar: GPPS-500, GPPS- 535 and GPPS-585.

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

| | | | | |
|---------------------------------------|--|--|--------------------------------------|---------------------|
| Elaboration: Inaldo Lopes da Costa | Section: Quality Control Laboratory | Revision: Adriane Ferreira da Silva | Approval: Helton dos Reis Barbosa | Date: 11.09.2008 |
|---------------------------------------|--|--|--------------------------------------|---------------------|

POLYPROPYLENE Material Safety Data Sheet



| I. General Information | | |
|---|---|-------------------------------|
| Chemical Name & Synonyms Polypropylene | Trade Name & Synonyms Natural Homopolymer Polypropylene, O, P grade polypropylene. | |
| Chemical Family Homopolymer Polypropylene | Formula [Ch (ch3) ch2.] | |
| Proper DOT Shipping Name: N/A | DOT Hazard Classification: N/A | |
| II. Ingredients | | |
| Principal Components | Percent | Threshold Limit Value (Units) |
| Polypropylene (9003-07-0) | >99% | 10mg/m3 (total dust) |
| | | |
| III. Physical Data | | |
| Boiling Point (Deg. F.) N/A | Specific Gravity (H2O=1) .90-.91 | |
| Vapor Pressure (mm Hg) N/A | Percent Volatile By Volume (%) | |
| Vapor Density (Air=1) N/A | Evaporation Rate (Air =1) N/A | |
| Solubility in Water Negligible | pH N/A | |
| Appearance & Odor Opaque, or white, solid, no odor | | |
| IV. Fire & Explosion Hazard Data | | |
| Flash Point (Test Method) >500F (260C) | Auto Ignition Temperature 735F (388C) | |
| Flammable Limits N/A | LEL N/A | UEL N/A |
| Extinguishing Media Water, Foam, Carbon Dioxide, Dry Chemical | | |
| Special Fire Fighting Procedures Slow burning plastic that emits a dense black smoke. Firefighters should wear a self-contained breathing apparatus and protective clothing. | | |
| Unusual Fire & Explosion Hazards Dust is flammable when finely divided (less than 200 mesh) and suspended in air. Combustion products may be hazardous. | | |

POLYPROPYLENE Material Safety Data Sheet



| V. Health Hazard Data | |
|--|---|
| OSHA Permissible Exposure Limit 15 mg/m3 total dust, 5 mg/m3 respirable dusts. | ACGIH Threshold Limit Value 10 mg/m3 total dust |
| Carcinogen - NTP Program NO | Carcinogen - IARC Program NO |
| Symptoms of Exposure Polypropylene heated to 700 deg. F can irritate the respiratory tract. | |
| Medical Conditions Aggravated By Exposure None known, however, seek medical attention if constant irritation occurs. If thermal decomposition occurs, upper respiratory, eye, nose, and throat irritation may result. | |
| Primary Route(s) of Entry Inhalation of particulates. | |
| Emergency First Aid Molten material. If molten material comes in contact with the skin, cool under running water. Do not attempt to remove the molten material from the skin. Get medical attention. | |
| VI. Reactivity Data | |
| STABILITY ___ Unstable X Stable INCOMPATIBILITY Hazardous ___ May Occur Polymerization X Will Not Occur | <u>Conditions To Avoid</u> None Known <u>Materials To Avoid</u> Strong oxidizing agents. <u>Conditions To Avoid</u> None Known |
| Hazardous Decomposition Products: Carbon Monoxide, Carbon Dioxide, organic oxidation products, acrid smoke, and fumes. | |
| VII. Environmental Protection Procedures | |
| Spill Response...Sweep up for Disposal or reuse. | |
| Waste Disposal Method...Incineration or landfill - dispose of in accordance with Federal, State and Local regulations. | |
| VIII. Special Protection Information | |
| Eye Protection Glasses with side shields. | Skin Protection Use insulated gloves when handling molten material. |
| Respiratory Protection (Specific Type) - NIOSH approved dust respirator recommended. If material is being burned wear an organic respirator. | |
| Ventilation Recommended - Local ventilation in dusty conditions, or if thermal decomposition occurs. | |
| Other Protection Gloves and protective garments when handling molten material. | |
| IX. Special Precautions | |
| Hygienic Practices In Handling & Storage: Wash with soap and water. | |
| Precautions For Repair & Maintenance Of Contaminated Equipment: Eliminate ignition sources. | |
| Other Precautions Avoid excess breathing of vapors, fumes, or smoke that may be released during thermal processing. Store in a sprinkler protected warehouse. Natural Homopolymer Polypropylene will burn if ignited. | |
| NFPA Code: Fire 1, Health 0, Reactivity 0 | |
| HMIS Code: Fire 1, Health 0, Reactivity 0 | |

POLYPROPYLENE Material Safety Data Sheet



X. Regulatory Information

OSHA Status: Polypropylene is not considered hazardous under OHSA.

TSCA Inventory Status: All ingredients are listed.

CERCLA Reportable Quantity (RQ): None

SARA Title III:

Section 302/304.No extremely hazardous substances

Section 311/312.No reporting requirements although it is suggested that storage of >10,000 lbs of polypropylene in one facility should be listed on a Tier II report.

Section 313: No reporting requirements.

Hazard data contained herein was obtained from raw material suppliers. The information presented is believed to be factual, as it was derived from the works and opinions of persons believed to be qualified. However, no facts contained in the information are to be taken as a warranty, or representation, for which A&C Plastics Inc. bears legal responsibility. The user should review any recommendation in the specific context of the intended use to determine if they are appropriate.

N.A.= Not Applicable N.E.= Not Established

TYPICAL PROPERTIES of POLYPROPYLENE

| ASTM or UL test | Property | Homopolymer | Co-Polymer | Flame Retardant |
|-------------------|---|------------------------|----------------------|---------------------|
| PHYSICAL | | | | |
| D792 | Density (lb/in ³) (g/cm ³) | 0.033 0.905 | 0.033 0.897 | 0.035 0.988 |
| D570 | Water Absorption, 24 hrs (%) | <0.01 | 0.01 | 0.02 |
| MECHANICAL | | | | |
| D638 | Tensile Strength (psi) | 4,800 | 4,800 | 4,300 |
| D638 | Tensile Modulus (psi) | 195,000 | - | - |
| D638 | Tensile Elongation at Yield (%) | 12 | 23 | 28 |
| D790 | Flexural Strength (psi) | 7,000 | 5,400 | - |
| D790 | Flexural Modulus (psi) | 180,000 | 160,000 | 145,000 |
| D695 | Compressive Strength (psi) | 7,000 | 6,000 | - |
| D695 | Compressive Modulus (psi) | - | - | - |
| D785 | Hardness, Rockwell R | 92 | 80 | - |
| D256 | IZOD Notched Impact (ft-lb/in) | 1.9 | 7.5 | 0.65 |
| THERMAL | | | | |
| D696 | Coefficient of Linear Thermal Expansion (x 10 ⁻⁵ in./in./°F) | 6.2 | 6.6 | - |
| D648 | Heat Deflection Temp (°F / °C) at 66 psi at 264 psi | 210 / 99 125 / 52 | 173 / 78 110 / 43 | 106 / 41 57 / 14 |
| D3418 | Melting Temperature (°F / °C) | 327 / 164 | 327 / 164 | 327 / 164 |
| - | Max Operating Temp (°F / °C) | 180 / 82 | 170 / 77 | 180 / 82 |
| C177 | Thermal Conductivity (BTU-in/ft ² -hr-°F) (x 10 ⁻⁴ cal/cm-sec-°C) | 0.76-0.81 2.6-2.8 | - - | - - |
| UL94 | Flammability Rating | HB | n.r. | V-O |
| ELECTRICAL | | | | |
| D149 | Dielectric Strength (V/mil) short time, 1/8" thick | 500-660 | 475 | 500-650 |
| D150 | Dielectric Constant at 1 kHz | 2.25 | 2.2-2.36 | 2.3 |
| D150 | Dissipation Factor at 1 kHz | 0.0005-0.0018 | 0.0017 | - |
| D257 | Volume Resistivity (ohm-cm) at 50% RH | 8.5 x 10 ¹⁴ | 2 x 10 ¹⁶ | 10 ¹⁵ |
| D495 | Arc Resistance (sec) | 160 | 100 | - |

NOTE: The information contained herein are typical values intended for reference and comparison purposes only. They should NOT be used as a basis for design specifications or quality control. Contact us for manufacturers' complete material property datasheets.

All values at 73°F (23°C) unless otherwise noted.

**MATERIAL SAFETY DATA SHEET****High Density Polyethylene (HDPE)****1. SUBSTANCE/PREPARATION & COMPANY/UNDERTAKING IDENTIFICATION**

| | |
|--------------------------|--|
| Chemical Name & Synonyms | : High Density Poly Ethylene (HDPE) |
| Trade Name | : OPALENE-HD |
| Chemical Family | : Polyolefin |
| C.A.S. No. | : 9002-88-4 |
| Manufacturer's Name | : ONGC Petro additions Limited |
| Address | : Polymer Marketing Group: 1st Floor, Omkara Complex, Sai Chowkdi, Manjalpur, Vadodara-390011, Gujarat, India |
| Telephone No. | : +91 265 6192600 |
| Fax No. | : +91 265 6192666 |
| Corporate Site | : www.opalindia.in |

2. COMPOSITION & INFORMATION ON INGREDIENTS

| CHEMICAL NAME | CONTENT (Normal)* | CAS NUMBER | EXPOSURE LIMITS IN AIR | | |
|---------------------------|-------------------|------------|--|----------------|------|
| | | | ACGIH TLV-TWA | ACGIH TLV-STEL | IDLH |
| High Density Polyethylene | >= 99 wt% | 9002-88-4 | 10 mg/m ³ (inhalable fraction) | NA | NA |
| Proprietary additives | < 1 wt% | Mixture | NA | NA | NA |
| Hazardous Components | None | NA | NA | NA | NA |

* For different grades of HDPE, minor changes may be there.

3. HAZARDS IDENTIFICATION

- Physio-chemical properties : No hazards resulting from material as supplied.
- Properties affecting health : No hazards resulting from material as supplied.
- Environmental properties : No hazards resulting from material as supplied.

Classification System

- This material is not hazardous by OSHA hazard communication definition.
- Dust may form explosive mixtures with air.
- At process Temperature irritating fumes may be produced.
- The preparation does not meet the criteria for classification in accordance with Directive 1999/45/EC and Directive 1272/2008/EC



4. FIRST AID MEASURES

GENERAL INFORMATION

At room temperature the product is neither an irritant nor gives off hazardous vapours. The measures listed below apply to critical situations (Fire, incorrect process conditions).

- **Skin Contact**
If molten material contacts the skin it may cause thermal burns, immediately flush with large amounts of cold water to cool the affected skin and polymer. Do not attempt to peel the polymer from skin. Obtain immediately emergency medical attention if burn is deep or extensive.
- **Eye Contact**
Dust, fines and process vapours may irritate the eyes. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical attention if discomfort persists.
- **Inhalation**
Dust and process vapours may irritate the nose, throat and respiratory tract. If symptoms are experienced, move victim to fresh air. Obtain medical attention if breathing difficulty persists.
- **Ingestion**
Adverse health effects due to ingestion are not anticipated. Do not induce vomiting. If symptoms develop, obtain medical attention.

5. FIRE FIGHTING MEASURES

| | |
|------------------------------------|--|
| Suitable Extinguishing Media | As appropriate for surrounding fire. Extinguish preferably with foam, carbon Dioxide, water/water mist or dry chemical. |
| Unsuitable Extinguishing Media | Do not use high volume water jet or waterspray. |
| Fire Fighting Protective Equipment | A self-contained breathing apparatus and suitable protective clothing, eye protection etc should be used in fire conditions. |
| Hazardous Decomposition Product | Combustion or thermal decomposition will evolve toxic and irritant vapours. |
| Unusual Fire & Explosion hazards | Polymer dust particles in the atmosphere are combustible and may be explosive. CO, olefinic and paraffinic compound, trace amount of organic acids, ketones, aldehydes and alcohols may be formed during combustion. |
| Other | Can melt and burn in a fire. Molten material tends to flow or drip and will propagate fire. |

6. ACCIDENTAL RELEASE MEASURES

- **Personal Precautions :**
 - Avoid generating dust. Potential dust explosion hazard. Use only non-sparking tools.
 - Material creates dangerous slipping hazard on hard surfaces.
 - Ensure adequate ventilation, especially in confined areas. In case of insufficient ventilation wear suitable respiratory equipment.
- **Environmental Precautions :**
 - Avoid release to environment. Do not allow to enter drains, sewers or watercourses.
- **Methods of cleaning up**
 - Take up mechanically and collect in suitable container for disposal.
 - Good housekeeping must be maintained to avoid potential slipping problem.
 - Keep walking surface free of spilled material to avoid slipping hazard.



7. HANDLING AND STORAGE

Handling :

- No special requirements necessary, if handled at room temperature.
- Avoid spilling the product, as this might cause falls.
- Will accumulate static charges that may cause an electric spark (ignition source).
- Take precautionary measures against static discharges.
- Do not eat, drink or smoke at the work place.
- After handling, wash face and hands before eating, drinking or smoking.

Storage :

Requirements to be met by storerooms and containers:

- This product may react with strong oxidising agents & should not be stored near such materials.
- Store the bags in areas protected with automatic sprinklers.
- Storage temperature should be ambient. (preferably below 50 °C)
- Open flames prohibited.
- Store the product in bags, car silos, container, or large cartons to avoid contamination.

Further information about storage conditions:

- Protect from heat and direct sunlight.
- Store container in a well ventilated position.
- Store under dry conditions.
- **Specific applications:** For industrial use only, for safe stacking follow the storage recommendations specific for this product.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS:

Use in a well-ventilated area. If handling results in dust generation, special ventilation may be needed to minimize dust exposure. If heated material generates vapour or fumes, use process enclosures, local exhaust ventilation, or other engineering controls to control exposure.

Occupational Exposure Limits:

| Substance | CAS No. | LTEL (8 hr TWA ppm) | LTEL (8 hr TWA mg/m ³) | STEL (ppm) | STEL (mg/m ³) | Remark |
|---------------------------|-----------|---|------------------------------------|------------|---------------------------|-----------------|
| High Density Polyethylene | 9002-88-4 | No Occupational Exposure limit assigned | | | | |
| Inert or Nuisance Dust | - | | 15 | | | Total dust |
| | | | 5 | | | Respirable dust |

* The USA-OSHA PEL for respirable dust is 5.0 mg/m³ and 15.0 mg/m³ for total dust.

* The ACGIH Guideline for respirable dust is 3.0 mg/m³ and 10.0 mg/m³ for total dust.

PERSONAL PROTECTIVE EQUIPMENT:

Respiratory system

Product processing, heat sealing of film or operations involving the use of wires or blades heated above 300°C may produce dust, vapour or fumes. To minimize risk of over exposure to dust, vapour or fumes it is recommended that a local exhaust system is placed above the equipment, and that the working area is properly ventilated. If ventilation is inadequate, use certified respirator that will protect against dust/mist.



High Density Polyethylene



- **Skin and body**

Hot material: Wear heat-resistant protective gloves, clothing and face shield able to withstand the temperature of the molten product. Cold material: None required; however, use of gloves is good industrial practice.

- **Hand**

Hot material: Wear heat-resistant protective gloves able to withstand the temperature of the molten product. Cold material: None required; however, use of gloves is good industrial practice.

The correct choice of protective gloves depends upon the chemicals being handled, the conditions of work and use, and the condition of the gloves (even the best chemically resistant glove will break down after repeated chemical exposures). Most gloves provide only short time of protection before they must be discarded and replaced. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Gloves should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

- **Eyes**

Safety glasses with side shields. Use dust goggles if high dust concentration is generated.

- **Environmental Protection**

Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9. PHYSICAL AND CHEMICAL PROPERTIES

| General Information | |
|--|-------------------------------|
| Form | Solid Granules |
| Colour | Translucent to White |
| Odour | Odourless |
| Melting point/Melting range | 120-150°C |
| Boiling Point (°C) | Not Applicable |
| Flash point | > 300°C |
| Auto Ignition temperature | > 300°C |
| Decomposition temperature | > 300°C |
| Danger of explosion | Product is not explosive. |
| Density | 0.940-0.970 g/cm ³ |
| pH (Value) | Not Applicable |
| Vapour Pressure (Pascal) | Not Applicable |
| Percent Volatile by volume (%) | <0.1 |
| Solubility in / Miscibility with Water | Insoluble |

10. STABILITY AND REACTIVITY

- **Chemical stability**

This product is stable under normal use conditions for shock, vibration, pressure or Temperature. Decomposes at prolonged heating above 300°C.

- **Chemical stability - Condition to Avoid**

Avoid strong oxidizing agents. Avoid Processing Material over 300°C. Avoid Heat & direct sunlight.

- **Hazardous Polymerisation**

Not likely to occur

- **Corrosivity**

Product is not corrosive

- **Materials to avoid**

Direct contact with open flames, self-igniting and explosive materials.



High Density Polyethylene



• Dangerous products of decomposition:

No hazardous decomposition products known at room temperature. At elevated temperature the material will begin to decompose producing fumes that can contain CO₂, CO, Ketones & Aldehydes.

11. TOXICOLOGICAL INFORMATION

Low toxicity under normal conditions of handling and use.

ACUTE TOXICITY:

Primary irritant effect:

- **On the skin** : No irritant effects from normal handling and use. Dust may have irritant effect on skin.
- **On the eye** : No irritant effect. Dust may have irritant effect on eyes. Permanent damage is unlikely.
- **Sensitization** : No sensitizing effect known.
- **Ingestion** : Low oral toxicity. High Density Polyethylene: LD50, oral (rat) : >5000 mg/kg
- **Inhalation** : Low acute toxicity. Dusts and vapours or fumes evolved during thermal processing may cause irritation to the respiratory system.

CHRONIC TOXICITY:

On long term exposure: Chronic effects unlikely

- **Carcinogenic effects** : No information available
- **Mutagenic effects** : No information available
- **Reproductive toxicity**: No information available

ADDITIONAL TOXICOLOGICAL INFORMATION:

When used and handled according to specifications, the product does not have any harmful effects according to our experience and the information provided to us.

12. ECOLOGICAL INFORMATION

- **Information about elimination (persistence and degradability):** The product is not biodegradable.
- **Effect of material on Plants or Animals :** Eco-toxicity is expected to be minimal based on the low water solubility of polymers.
- **Toxicity:** This material is not volatile and it is insoluble in water. Low toxicity to aquatic organisms.
- **Effect on Effluent Treatment:** Unlikely to affect biological treatment processes.

General notes:

The product is not toxic, small particles can have physical effects on water and soil organisms.

13. DISPOSAL CONSIDERATIONS

Product:

Recommendation:

- **Recycle (Reprocess)**
- Do not allow to enter drains, sewers or watercourses.
- Disposal through landfilled or controlled incineration or authorised waste dump in accordance with Local, State or National Regulations.
- Waste generators must determine whether a discarded chemical is classified as a hazardous waste.



High Density Polyethylene



Uncleaned Packaging: Recommendation:

- Disposal must be done according to local/official regulations. Refer to manufacturer/supplier for information on recovery/recycling.

14. TRANSPORT INFORMATION

- Land transport
ADR/RID Class: Not classified as dangerous in the meaning of transport regulations.
- Sea transport
IMDG Class: Not classified as dangerous in the meaning of transport regulations.
- Air transport
ICAO/IATA Class: Not classified as dangerous in the meaning of transport regulations.

15. REGULATORY INFORMATION

National regulations, other regulations, limitations and prohibitive regulations

- EC Classification : Not classified as dangerous for supply/use.
- Hazard Symbol : Not applicable.
- Risk Phrases : Not applicable.
- Safety Phrases : Not applicable.

HDPE manufactured by OPaL shall meet the requirement stipulated in IS: 10146 on "Specification for Polyethylene and its copolymer for safe use in contact with foodstuff, Pharmaceuticals & Drinking Water". Additives incorporated in this product shall conform to the positive list of constituents as prescribed in IS: 10141. The product & additives incorporated in it shall also comply with FDA: CFR Title 21,177.1520 Olefin Polymers.

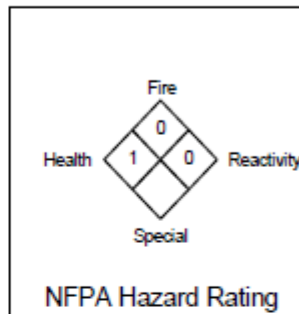
For specific regulatory compliance related information please contact OPaL.

16. OTHER INFORMATION

The information provided in this Material Safety Data Sheet has been based upon the current level of information available, for the purpose of specifying the requirements regarding environment, health and safety in conjunction with the product. They are not to be interpreted as a warranty for specific product characteristics. OPaL takes no responsibility for inappropriate use, processing and handling by purchasers and users of the product. The data provided here is applicable only to the Product sold by OPaL and not to products sold by others. It relates only to the Product and does not relate to its use in combination with any other product or material or in any process. Local laws and regulations and conditions of use and suitability of the product for particular uses are beyond the control of OPaL; all risks of use, storage, handling, transportation and disposal of the Product are therefore assumed by the user and OPaL expressly disclaims all warranties of every kind and nature, including warranties of merchantability and fitness for a particular purpose in respect to the use or suitability of the Product. OPaL shall not be responsible for any damage or injury resulting from abnormal use of the Product, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the Product. Appropriate warnings and safe handling procedures should be provided to all handlers and users.

**Material Safety Data Sheet: PVC COMPOUNDS
PELLET AND POWDER****1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**

Product name PVC Compounds
2000 thru 3999 & 5000 thru
9999 Pellet and Powder:
All Colors



Effective Date February 10, 2005

Synonyms Polyvinyl Chloride compound, chloroethylene homopolymer compound

Chemical Formula $(C_2H_3Cl)_n$ plus functional additives

CAS Name & No. Not applicable (mixture)

Manufacturer's name and address Georgia Gulf Chemicals & Vinyls, LLC
PVC Compound Division
210 Industrial Dr. North
Madison, MS, USA 39110

Emergency telephone number For transportation emergencies:
CHEMTREC (800) 424-9300
For all other emergencies: (225) 685-2500

MSDS Contact Corporate Health & Safety Department
P.O. Box 629
Plaquemine, LA 70765-0629
Phone Number (225) 685-2500

Material Safety Data Sheet: PVC COMPOUNDS
PELLET AND POWDER**2. COMPOSITION/INFORMATION ON INGREDIENTS**

| Component | CAS No. | WT% |
|---------------------------|-----------|------|
| Polyvinyl Chloride Resin | 9002-86-2 | >30% |
| Organotin or Calcium-zinc | Mixture | <5% |
| Proprietary Additives | Mixture | <70% |

3. HAZARDS IDENTIFICATION**PRECAUTIONARY INFORMATION**

Caution: If proper procedures for processing PVC compounds are not followed, processing fumes and vapors can be liberated at elevated temperatures. The presence of these fumes or vapors may result in exposure. Additionally, the composition of these fumes or vapors may vary widely according to the individual processing procedures and materials used. Processors must determine for themselves the appropriate equipment and procedures for their use.

POTENTIAL HEALTH EFFECTS

Primary Routes of Exposure: Inhalation of process emissions during periods of elevated temperature.

Eye: Vapors or fumes emitted during processes involving elevated temperatures may cause eye irritation. Dust resulting from the handling of powder may be irritating to the eyes.

Skin Contact: Vapors or fumes emitted during processes involving elevated temperatures may cause skin irritation. Dust resulting from the handling of powder may be irritating to the skin.

Skin Absorption: This material is initially a dry solid pellet or powder; no absorption is likely to occur in its initial form. Vapors or fumes emitted during processes involving elevated temperatures may absorb through the skin at low levels.

Ingestion: Slightly toxic by ingestion. Powder form may become airborne during handling, resulting in the potential for incidental ingestion. Vapors or fumes emitted during processes involving elevated temperature may be ingested at low levels. Adequate ventilation should be provided.

Inhalation: Powder form may become airborne during handling, resulting in potential inhalation exposure. Vapors or fumes emitted during processes involving elevated temperatures may be inhaled if not adequately ventilated.

**Material Safety Data Sheet: PVC COMPOUNDS
PELLET AND POWDER****3. HAZARDS IDENTIFICATION (continued)****HAZARD CLASSIFICATION****Acute Effects:**

Dust associated with the handling of PVC powder as well as fumes or vapors liberated from both PVC powder and pellets at high temperatures may be irritating to the eyes, skin and respiratory tract if not adequately ventilated.

Chronic Effects:

Chronic exposure to fumes and vapors from heated or thermally decomposed plastics may cause an asthma-like syndrome due to the inhalation of process vapors or fumes. The onset of irritation may be delayed for several hours. Fumes or vapors may accumulate within the facility during normal operating procedures that involve elevated temperatures. Exposure to these elevated concentrations, if not adequately ventilated, may have significant health effects.

Carcinogenic:

IARC has determined that there is inadequate evidence of carcinogenicity of a polyvinyl chloride resin in both animals and humans. The overall evaluation of polyvinyl chloride is Group 3, meaning that it is not classifiable as a carcinogen (IARC Vol. 19, 1979). Polyvinyl chloride is not listed as a carcinogen by OSHA, NIOSH, NTP, IARC or EPA.

Some pigments used to color PVC compounds may contain metals, which in some of their chemical forms are suspected or confirmed carcinogens. These metals are bound in the crystalline structure of the pigment, and to the best of the supplier's knowledge, do not present a significant health risk. Additionally, the low levels of pigments used in PVC pellet compounds are also bound in the polymer matrix and to the best of our knowledge do not present a significant health risk.

4. FIRST AID MEASURES**Inhalation**

No adverse effects anticipated under normal conditions if adequately ventilated. However, if exposure occurs, remove victim to fresh air. Obtain medical attention if irritation persists.

Skin Contact

No adverse effects anticipated under normal conditions. However, if vapor or fume exposure occurs, wash skin thoroughly with soap and water. Obtain medical attention if irritation persists.

Eye Contact

In the event of eye irritation, flush eyes with water for at least 15 minutes. Obtain medical attention if irritation persists.

Ingestion

If ingestion occurs, vomiting can be induced after diluting with water or milk. Call a physician for additional medical advice.

Material Safety Data Sheet: PVC COMPOUNDS
PELLET AND POWDER**5. FIRE FIGHTING MEASURES**

| | |
|-------------------------------------|----------------|
| Flash Ignition Temperature | >600°F |
| Flammable Limits (% By Vol.) | |
| Lower Explosive Limit (LEL) | Not Applicable |
| Upper Explosive Limit (UEL) | Not Applicable |
| Autoignition Temperature | Not Applicable |

Fire Fighting Procedures/Fire Extinguishing Media

Carbon dioxide or water.

Unusual Fire and Explosion Hazards

Dense smoke may be emitted when burned. Rigid PVC Compounds will not normally continue to burn after ignition without an external fire source. Do not allow fire fighting runoff water to enter streams, rivers or lakes. The water may collect HCl and other combustion products. See Section 10 for additional information.

Fire-Fighting Equipment

Wear full bunker gear including a positive pressure self-contained breathing apparatus in any closed space.

6. ACCIDENTAL RELEASE MEASURES**Protect People:**

Remove unnecessary personnel from the release area. Wear appropriate personal protection equipment during clean-up.

Protect the Environment:

Contain material to prevent contamination of the soil, surface water or ground water.

Clean Up:

Sweep or vacuum material and place in a disposal container. See Section 11.

7. HANDLING AND STORAGE**Handling**

Use the proper personal protective equipment during handling. Minimize dust generation and accumulation. Use good housekeeping practices.

Storage

Store in a cool, dry, protected area away from heat, sparks, and flame.

Material Safety Data Sheet: PVC COMPOUNDS PELLET AND POWDER

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines. Adequate ventilation should be provided as conditions warrant. Local exhaust ventilation should comply with OSHA regulations and the American Conference of Governmental Industrial Hygienists, Industrial Ventilation - A Manual of Recommended Practice.

Respiratory Protection

For most conditions, no respiratory protection should be needed. However, in cases of dust formation, NIOSH-approved respiratory protection meeting the requirements of 29 CFR 1910.134 may be needed. If the material is overheated and starts smoldering, wear a positive pressure self-contained breathing apparatus for respiratory protection.

Eye Protection

Use safety glasses. If there is a potential for exposure to particles, which could cause mechanical injury to the eye, wear chemical goggles.

Skin Protection

Normally clean clothing should be sufficient. However, skin protection meeting the requirements of 29 CFR 1910.132 may be needed. Wash skin if contacted by PVC powder or pellets. Wash contaminated clothing before reusing.

Exposure Guidelines

No exposure limits have been established for PVC Compound. It is recommended that exposure be kept below the limits for both respirable and total nuisance dust (PNOC):

| | | | |
|-----------|--|------------|---|
| OSHA-PEL: | 15 mg/M ³ 8 hr-TWA (total dust) | ACGIH-TLV: | 10 mg/M ³ 8 hr-TWA (inhalable) |
| | 5 mg/M ³ 8 hr-TWA (respirable) | | 3 mg/M ³ 8 hr-TWA (respirable) |

The following materials may be present in this product, but are not anticipated to exceed exposure limits under normal conditions:

| Chemical | OSHA-PEL | ACGIH-TLV |
|----------------------------|--|--|
| Calcium Carbonate | 15 mg/M ³ 8 hr-TWA (total dust) 5mg/M ³ 8 hr-TWA (respirable) | 10 mg/M ³ 8 hr-TWA |
| Carbon Black | 3.5 mg/M ³ 8 hr-TWA | 3.5 mg/M ³ 8 hr-TWA |
| Titanium Dioxide | 10 mg/M ³ 8 hr-TWA | 10 mg/M ³ 8 hr-TWA (total dust) |
| Antimony Trioxide | N/A | 0.5 mg/M ³ 8 hr-TWA |
| Barium Compounds (soluble) | 0.5 mg/M ³ 8 hr-TWA | 0.5 mg/M ³ 8 hr-TWA |
| Arsenic Compounds | 0.5 mg/M ³ 8 hr-TWA (organic) 0.1 mg/M ³ 8 hr-TWA (inorganic) | 0.01 mg/M ³ 8 hr-TWA (elemental/inorganic) |
| Chromium Compounds | 0.5 mg/M ³ 8 hr-TWA (Cr II and Cr III) | 0.5 mg/M ³ 8 hr-TWA (Metals and Cr III) |
| Tin, organic compounds | 0.1 mg/M ³ 8 hr-TWA | 0.1 mg/M ³ 8 hr-TWA 0.2 mg/M ³ STEL |
| Hydrogen chloride | 5 ppm Ceiling | 2 ppm Ceiling |

**Material Safety Data Sheet: PVC COMPOUNDS
PELLET AND POWDER****8. EXPOSURE CONTROLS/PERSONAL PROTECTION****(Continued)**

Additional hazardous constituents may be released during processes involving elevated temperatures. These constituents are dependent on processing conditions and should be verified by processor.

Under normal processing conditions, no occupational exposures to vinyl chloride monomer exceeding the established exposure limits for this material are anticipated. The OSHA-PEL for vinyl chloride is 1 ppm over an 8-hr TWA. The OSHA-STEL for vinyl chloride is 5 ppm for any 15minute period.

Local and state regulations regarding the handling and storage of chemicals may vary widely. The user should acquire knowledge of these and other appropriate federal and state laws and regulations as well as consult with the proper authority for guidance in developing adequate handling procedures and constructing appropriate storage facilities.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|------------------------|
| Appearance | Pellets or Powder |
| Odor | Odorless to Mild |
| Boiling Point, Melting Point, Freezing Point | Not Applicable |
| Specific Gravity (Water = 1.0) | 1.25 - 1.55 |
| Vapor Pressure (mm of Mercury) | < 0.1 |
| pH | Not Applicable – Solid |

10. STABILITY AND REACTIVITY**Stability**

Stable

Polymerization

Hazardous polymerization will not occur.

Hazardous Decomposition Products

Overheating may cause thermal degradation of PVC compound. Fumes and vapors (including CO, CO₂, and HCl) may be generated during this thermal degradation. Emissions are also possible during normal operating conditions, and may accumulate within an inadequately ventilated facility.

**Material Safety Data Sheet: PVC COMPOUNDS
PELLET AND POWDER****10. STABILITY AND REACTIVITY (Continued)****Incompatible Materials**

Polyvinyl chloride compounds should not come into contact with acetal or acetal copolymers in elevated temperature processing equipment. The two materials are not compatible and will react in a violent decomposition when mixed under conditions of heat and pressure.

11. TOXICOLOGICAL INFORMATION

The following information on polyvinyl chloride is extracted from both the HSDB and NTP databases.

Animal Toxicity

| | | |
|-------------|-------------------------|----------------------------|
| Oral: | Rat, TD _{1,0} | 210 gm/kg |
| Inhalation: | Mouse, LC ₅₀ | 140 mg/M ³ /10M |

TD_{1,0} = Lowest toxic dose in a given species by a given route of exposure.

LC₅₀ = Concentration that is lethal to 50% of a given species by a given route of exposure.

Rodents exposed to PVC by dietary or inhalation routes for 6 to 24 months have shown no significant toxicological effects.

12. ECOLOGICAL INFORMATION**Environmental Fate:**

| | |
|-----------------|-------------------------------|
| Aquatic: | No data available |
| Biodegradation: | Not subject to biodegradation |

Ecotoxicity: Based on the high molecular weight of this polymeric material, transport of this compound across biological membranes is unlikely. Accordingly, the probability of environmental toxicity or bioaccumulation in organisms is remote. Due caution should be exercised to prevent the accidental release of this material to the environment.

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13. DISPOSAL CONSIDERATIONS

Waste Management Information: Do not dump into any sewers, on the ground, or into any body of water. Any disposal practice must be in compliance with local, state and federal laws and regulations (contact local or state environmental agency for specific rules). Waste characterization and compliance with applicable laws are the responsibility of the waste generator.

14. TRANSPORTATION INFORMATION

| | |
|-----------------------|--------------------|
| Proper Shipping Name | Polyvinyl Chloride |
| DOT - Hazard Class | None |
| DOT - Shipping ID No. | None |
| DOT - Labeling | None |

15. REGULATORY INFORMATION

Regulatory information is not meant to be all-inclusive. It is the user's responsibility to ensure compliance with federal, state or provincial and local laws.

SARA Title III

Section 302 and 304 of the Act; Extremely Hazardous Substances (40 CFR 355)

| <u>COMPONENT</u> | <u>CAS No.</u> | <u>TPQ (lbs)</u> | <u>RQ (lbs)</u> |
|------------------|----------------|------------------|-----------------|
| None | N/A | N/A | N/A |

Note: TPQ - Threshold Planning Quantity RQ - Reportable Quantity

Section 311 Hazard Categorization (40 CFR 370)

| <u>ACUTE</u> | <u>CHRONIC</u> | <u>FIRE</u> | <u>PRESSURE</u> | <u>REACTIVE</u> |
|--------------|----------------|-------------|-----------------|-----------------|
| Not Listed | | | | |

Section 313 Toxic Chemicals (40 CFR 372.65)

This product contains the following EPCRA Section 313 chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986

| <u>COMPONENT</u> | <u>CAS No.</u> | <u>WT.%</u> |
|--------------------|----------------|-------------|
| Antimony Compounds | N010 | 0-20% |
| Barium Compounds | N040 | 0-10% |
| Zinc Compounds | N982 | 0-10% |

CERCLA

Section 102(a) Hazardous Substances (40 CFR 302.4)

| <u>COMPONENT</u> | <u>CAS No.</u> | <u>WT.%</u> | <u>RQ (lbs)</u> |
|------------------|----------------|-------------|-----------------|
| None | N/A | N/A | N/A |



Chemicals and Vinyls, LLC

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15. REGULATORY INFORMATION CONTINUED

RCRA

This product, as supplied, is not a hazardous waste according to the USEPA's Toxicity Characteristic Leaching Procedure. Any physical or chemical modification of this product may change the TCLP test results.

TSCA

All components are listed on the TSCA inventory or are exempt.

Proposition 65

This product contains substances known to the State of California to cause cancer and/or reproductive toxicity.

Canadian Regulations

This product has been classified according to the hazard criteria of the Canadian Controlled Products Regulations, Section 33 and the MSDS contains all information required by this regulation.

WHMIS Classification- Not a Controlled Product

Canadian Environmental Protection Act (CEPA)

All substances in this product are listed on the Canadian Domestic Substances (DSL) list or are not required to be listed.

OSHA 29 CFR 1910.1017:

This compound may contain trace levels (<0.001%) of VCM. Under normal working conditions with adequate ventilation, neither the OSHA-PEL of 1 ppm (8-hr TWA), nor the OSHA-STEL (5.0 ppm) should be exceeded. The workplace should be monitored and if the level exceeds any of the PELs or action levels, refer to 29 CFR 1910.1017.

16. OTHER INFORMATION

IMPORTANT: The information and data herein are believed to be accurate and have been compiled from sources believed to be reliable. It is offered for your consideration, investigation and verification. Buyer assumes all risk of use, storage, handling and disposal of the product in compliance with applicable federal, state, and local laws and regulations. **GEORGIA GULF CHEMICALS AND VINYLs, LLC MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, CONCERNING THE ACCURACY OR COMPLETENESS OF THE INFORMATION AND DATA HEREIN.** Georgia Gulf will not be liable for claims relating to any party's use of or reliance on information and data contained herein regardless of whether it is claimed that the information and data are inaccurate, incomplete or otherwise misleading. This information relates to the material designated and may not be valid for such material used in combination with any other materials nor in any process.

MSDS Status: Revision Date 2/10/05

Supersedes 12/11/03

Date: 2/10/05

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Plastics Compatibility and Weld Quality Table



| | ABS | ABS/PA | ASA | COC | MABS | PA12 | PA612 | PA6 | PA 6-3-T | PA PACM12 | PA66 | PBT | PBT/ASA | PC | PE-HD | PE-LD | PEEK | PES | PMMA | POM | PP | PPS | PPSU | PS | PSU | PTFE | SAN | TPE |
|-----------|------|--------|------|------|------|------|-------|------|----------|-----------|------|------|---------|------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| ABS | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| ABS/PA | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| ASA | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| COC | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| MABS | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PA12 | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PA612 | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PA6 | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PA 6-3-T | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PA PACM12 | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PA66 | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PBT | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PBT/ASA | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PC | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PE-HD | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PE-LD | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PEEK | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PES | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PMMA | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| POM | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PP | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PPS | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PPSU | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PS | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PSU | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| PTFE | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| SAN | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| TPE | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |

Variations of weldability/compatibility will vary dependant on laser wavelength

For further information see: plasticsoupfoundation.org

This publication was produced on the occasion of the exhibition Liz Larner *below above*. It is a collection of research materials and documents gathered by the artist in preparation for working with the refuse plastic used in the work *Meerschaum Drift*, 2022.

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