

Standard Operating Procedure

Polyester Resin

Laboratory Safety Manual and Chemical Hygiene Plan.

Department:	Mechanical Engineering
Date SOP was written:	11/4/2015
Date SOP was approved by PI/lab supervisor:	11/5/2015
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Location(s) covered by this SOP:	Olin 413, Olin 515

Type of SOP: ☐ Process ☒ Hazardous Chemical ☐ Hazardous Class

Purpose

Polyester resins are unsaturated synthetic resins formed by the reaction of dibasic organic acids and polyhydric alcohols. Polyester resins are used in sheet moulding compound, bulk moulding compound and the toner of laser printers. Wall panels fabricated from polyester resins reinforced with fiberglass — so-called fiberglass reinforced plastic. Polyester Resin is used by the VADL in the making of Fiberglass structures such as molds.

Physical & Chemical Properties/Definition of Chemical Group

Class: Flammable Liquid Class IC

Odor: Pungent

Form (physical state): Liquid

Boiling point: 145 °C

Flash Point: 29 °C

Water Solubility: Insoluble

Potential Hazards/Toxicity

FLAMMABLE LIQUID AND VAPOR. MAY AFFECT THE CENTRAL NERVOUS SYSTEM CAUSING DIZZINESS, HEADACHE OR NAUSEA. MAY BE HARMFUL IF INHALED. ASPIRATION HAZARD IF SWALLOWED – CAN ENTER LUNGS AND CAUSE DAMAGE. MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION. PROLONGED OR REPEATED CONTACT MAY DRY SKIN, CAUSE IRRITATION AND BURNS.

Personal Protective Equipment (PPE)

General advice: These recommendations provide general guidance for handling this product. Personal protective equipment should be selected for individual applications and should consider factors which affect exposure potential, such as handling practices, chemical concentrations and ventilation. It is ultimately the responsibility of the employer to follow regulatory guidelines established by local authorities.

Exposure controls: Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below TLV(s). OSHA has formally endorsed a styrene industry proposal for a voluntary 50 ppm workplace limit on styrene. Members of the Styrene Information and Research Council (SIRC), Composites Institute (CI), Composite Fabricators Association (CFA), International Cast Polymers Association (ICPA) and National Marine Manufacturers Association (NMMA) have agreed to use either engineering controls, work practices or respiratory protection to achieve this voluntary limit for styrene.

Eye protection: Chemical splash goggles in compliance with OSHA regulations are advised; however, OSHA regulations also permit other type safety glasses. Consult your safety representative.

Skin and body protection: Wear resistant gloves (consult your safety equipment supplier). To prevent repeated or prolonged skin contact, wear impervious clothing and boots.

Respiratory protection: If workplace exposure limit(s) of product or any component is exceeded (see exposure guidelines), a NIOSH-approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH respirators (negative pressure type) under specified conditions (see your industrial hygienist). Engineering or administrative controls should be implemented to reduce exposure.

EXPOSURE GUIDELINES

<u>STYRENE</u>		<u>100-42-5</u>
ACGIH	Time weighted average	20 ppm
ACGIH	Short term exposure limit	40 ppm
NIOSH	Recommended exposure limit (REL):	50 ppm
NIOSH	Recommended exposure limit (REL):	215 mg/m ³
NIOSH	Short term exposure limit	100 ppm
NIOSH	Short term exposure limit	425 mg/m ³
OSHA Z2	Time weighted average	100 ppm
OSHA Z2	Ceiling limit value	200 ppm
OSHA Z2	Maximum concentration	600 ppm

First Aid Procedures

Eyes: If symptoms develop, immediately move individual away from exposure and into fresh air. Flush eyes gently with water for at least 15 minutes while holding eyelids apart; seek immediate medical attention.

Skin: Remove contaminated clothing. Flush exposed area with large amounts of water. If skin is damaged, seek immediate medical attention. If skin is not damaged and symptoms persist, seek medical attention. Launder clothing before reuse.

Ingestion: Seek medical attention. If individual is drowsy or unconscious, do not give anything by mouth; place individual on the left side with the head down. Contact a physician, medical facility, or poison control center for advice about whether to induce vomiting. If possible, do not leave individual unattended.

Inhalation: If symptoms develop, move individual away from exposure and into fresh air. If symptoms persist, seek medical attention. If breathing is difficult, administer oxygen. Keep person warm and quiet; seek immediate medical attention.

Note to Physicians

Hazards: This material is an aspiration hazard. Potential danger from aspiration must be weighed against possible oral toxicity (see Section 2 – Swallowing) when deciding whether to induce vomiting.

Potential Health Effects

Exposure Routes: Inhalation, skin absorption, skin contact, eye contact, ingestion

Eye Contact: Can cause eye irritation. Symptoms include stinging, tearing, redness, and swelling of eyes.

Skin Contact: Can cause skin irritation. Prolonged or repeated contact may dry the skin. Symptoms may include redness, burning, and drying and cracking of skin, burns and other skin damage. Passage of this material into the body through the skin is possible, but it is unlikely that this would result in harmful effects during safe handling and use.

Ingestion: Swallowing small amounts of this material during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful. This material can get into the lungs during swallowing or vomiting. This results in lung inflammation and other lung injury.

Inhalation: Breathing aerosol and/or mist is possible when material is sprayed. Aerosol and mist may present a greater risk of injury because more material may be present in the air than from vapor alone. Breathing small amounts of this material during normal handling is not likely to cause harmful effects. Breathing large amounts may be harmful. Symptoms are not expected at air concentrations below the recommended exposure limits, if applicable.

Aggravated Medical Conditions: Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: respiratory tract, skin, lung (for example, asthma-like conditions), liver, male reproductive system, auditory system.

Symptoms: Signs and symptoms of exposure to this material through breathing, swallowing, and/or passage of the material through the skin may include: metallic taste, stomach or intestinal upset (nausea, vomiting, diarrhea), irritation (nose, throat, airways), central nervous system depression (dizziness, drowsiness, weakness, fatigue, nausea, headache, unconsciousness) and other central nervous system effects, loss of coordination, confusion, liver damage.

Target Organs: Overexposure to this material (or its components) has been suggested as a cause of the following effects in laboratory animals: mild, reversible kidney effects, effects on hearing, respiratory tract damage (nose, throat, and airways), testis damage, liver damage, Overexposure to this material (or its components) has been suggested as a cause of the following effects in humans: mild effects on color vision, effects on hearing, respiratory tract damage (nose, throat, and airways), central nervous system effects.

Carcinogenicity: Styrene is listed as a possible human carcinogen by the International Agency for Research on Cancer (IARC) and as reasonably anticipated to be a human carcinogen by the National Toxicology Program (NTP).

Reproductive Hazard: This material (or a component) has been shown to cause harm to the fetus in laboratory animal studies. Harm to the fetus occurs only at exposure levels that harm the pregnant animal. The relevance of these findings to humans is uncertain.

Other Information: Styrene readily reacts with low concentrations of halogens (for example, fluorine, chlorine, bromine, or iodine) to form a tear-producing substance.

Special Handling and Storage Requirements

Handling: Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid, and/or solid), all hazard precautions given in the data sheet must be observed. Avoid prolonged or frequently repeated skin contact with this material. Skin contact can be minimized by wearing impervious protective gloves. As with all products of this nature, good personal hygiene is essential. Hands and other exposed areas should be washed thoroughly with soap and water after contact, especially before eating and/or smoking. Regular laundering of contaminated clothing is essential to reduce indirect skin contact with this material. Static ignition hazard can result from handling and use. Electrically bond and ground all containers, personnel and equipment before transfer or use of material. Special precautions may be necessary to dissipate static electricity for non-conductive containers. Use proper bonding and grounding during product transfer as described in National Fire Protection Association document NFPA 77. **Warning:** Sudden release of hot organic chemical vapors or mists from process equipment operating at elevated temperature and pressure, or sudden ingress of air into vacuum equipment, may result in ignitions without the presence of obvious ignition sources. Published "autoignition" or "ignition" temperature values cannot be treated as safe operating

temperatures in chemical processes without analysis of the actual process conditions. Any use of this product in elevated temperature processes should be thoroughly evaluated to establish and maintain safe operating conditions.

Storage: Store in closed containers in a dry, well-ventilated area. Do not store near extreme heat, open flame, or sources of ignition.

Spill and Accident Procedure

Personal precautions: For personal protection see page 2. Eliminate all ignition sources (flares, flames including pilot lights, electrical sparks). Persons not wearing protective equipment should be excluded from area of spill until clean-up has been completed. Stop spill at source. Prevent from entering drains, sewers, streams or other bodies of water. Prevent from spreading. If runoff occurs, notify authorities as required. Pump or vacuum transfer spilled product to clean containers for recovery. Absorb unrecoverable product. Transfer contaminated absorbent, soil and other materials to container for disposal.

Environmental precautions: Prevent run-off to sewers, streams or other bodies of water. If run-off occurs, notify proper authorities as required, that a spill has occurred. Methods of cleaning up: Absorb liquid on vermiculite, floor absorbent or other absorbent material.

Medical Emergency Dial 911

Decontamination/Waste Disposal Procedure

Waste disposal methods: Dispose of in accordance with all applicable local, state and federal regulations. Do not discharge effluent containing this product into lakes, streams, ponds or estuaries, oceans, or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit, and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the EPA. Dispose of in accordance with all applicable local, state and federal regulations.

Vanderbilt Aerospace Design Laboratory

Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothes)	Procedure Steps and Precautions
1. Use in Mold	Use no more than 4x the weight of fiber cloth used in the composite mold by weight	<p>Work with polyester resin should never be performed alone.</p> <p>Eliminate ignition sources such as open flames, hot surfaces, steam baths, static electricity, and operation of mechanical and electrical equipment that is not intrinsically safe.</p> <p>Ensure proper grounding and avoid creating static electricity. Be sure to ground metal containers when transferring flammable liquids.</p> <p>Fumes are dangerous. Work in a well ventilated lab and keep the fume hood on.</p>	<p>Eye protection: Chemical splash goggles in compliance with OSHA regulations are advised; however, OSHA regulations also permit other type safety glasses.</p> <p>Gloves: Nitrile gloves</p> <p>Clothing: Close toes shoes and no exposed skin below waist</p>	<p>1. Ensure PPE and ventilation</p> <p>2. Carefully weigh desired amount of polyester resin in clean glass or non-reactive measuring cup</p> <p>Avoid contact with skin and inhalation of fumes</p> <p>3. weight desired amount of MEKP hardener for application</p> <p>4. Mix resin and hardener</p> <p>5. Apply to fiberglass mold, spreading with a brush.</p> <p>6. Dispose in compliance with above disposal section.</p>

Documentation of Training (signature of all users is required)

- Prior to conducting any work with polyester resin, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
- The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.
- The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last one year.

I have read and understand the content of this SOP:

Name	Signature	Identification	Date
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Vanderbilt Aerospace Design Laboratory

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