



Safe Handling of Monomers, Oligomers and UV/EB Coatings



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January 8, 2008**



UV/EB Coatings

- **Major components of UV/EB coatings**
 - **Acrylic monomers, oligomers and polymers**
- **Minor components**
 - **Photoinitiators**
 - **Amine synergists**
 - **Others**
 - **Pigments or colorants**
 - **Slip agents**



Health Effects

- **Acrylic monomers**
 - **May cause eye irritation/skin irritation (contact dermatitis) if improperly handled**
 - **Potential for skin sensitization (allergic skin reaction)**
- **Acrylic oligomers and polymers are minimally irritating or non-irritating**
 - **May contain diluting monomers**



Health Effects

- **Skin contact**
 - **Symptoms of irritation -- redness, rash, blisters**
 - “Poison ivy”
 - **Symptoms may be delayed**
 - **Skin response varies; more severe if contact is prolonged**
 - **Sensitization**
- **Eye contact**
 - **Symptoms -- redness, irritation or pain, tearing**



Health Effects

- **Methacrylate monomers tend to be less irritating than their acrylate counterparts**
- **Alkoxyated monomers tend to be less irritating than their non-alkoxyated counterparts**

Acrylate Monomers With Low Skin Irritation Potential

Name	Synonym
Polyethylene Glycol Diacrylates	PEGDA
2-Phenoxyethyl Acrylate	2-PEA
Alkoxyated Bisphenol A Diacrylates	EOBPADA
Ditrimethylolpropane Tetraacrylate	Di-TMPTA
Dipentaerythritol Pentaacrylate	Di-PEPA
Tris(2-Hydroxyethyl)Isocyanurate Triacrylate	THEICTA
Ethoxylated Trimethylolpropane Triacrylates	EOTMPTA
Propoxylated Trimethylolpropane Triacrylates	POTMPTA
Propoxylated Neopentyl Glycol Diacrylates	PONPGDA
Alkoxyated Pentaerythritol Tetraacrylates	EO/POPETA
Alkoxyated Hexanediol Diacrylates	EO/POHDDA



Health Effects

- **Acrylic monomers, oligomers and polymers**
 - Not expected to present an inhalation hazard at room temperature
 - Low volatility (low vapor pressures, high boiling points)
 - May be irritating if inhaled via spraying or misting applications, or from vapors generated at elevated temperatures
 - Prevent exposures with appropriate general and local exhaust ventilation

Comparison of Vapor Pressures

Chemical	Vapor pressure (mm Hg at 25C/77F)
TMPTA	0.0002 at 25C/77F 0.024 at 100C/212F
EOTMPTA	Nil
Heptane	40
MEK	77
Methanol	100
Hexane	150
Acetone	182



Health Effects

- **Chronic hazards**
 - **Acrylates and methacrylates are not considered carcinogens by EPA**
 - **Not regulated as carcinogens by OSHA, IARC, NTP**



Safe Handling Practices

- **Personal protective equipment (PPE)**
- **Personal hygiene**
- **Housekeeping**
- **Knowledge of UV materials**
 - **Thoroughly read and understand the MSDS before using material**

Personal Protective Equipment

- **Skin contact**



- **Gloves (nitrile, neoprene, butyl rubber)**
 - **Do not use latex gloves**
- **Protective clothing (apron, work clothes)**
- **Barrier creams**
- **Safety shoes (impervious)**
 - **Do not wear canvas or suede**
- **For spill clean up, wear added protection, including overboots if needed**



Personal Protective Equipment

- **Eye contact**

- **Safety glasses**
- **Chemical splash goggles**
- **Safety glasses or goggles with faceshield**
- **UV protection, as needed**



Personal Protective Equipment

- **Inhalation**
 - **If vapors or aerosols are generated...**
 - **Engineering controls recommended first**
 - **Adequate ventilation, local exhaust ventilation**
 - **Air-purifying respirator (APR) is recommended (as needed)**
 - **Use APR with organic vapor cartridges if vapor generation**
 - **Use APR with dust/mist cartridges if aerosols are generated**





Personal Hygiene

- **Meticulous handwashing**
- **Immediately wash contaminated skin**
 - Use lukewarm or cool water with mild, non-abrasive soap)
 - Do not use solvents to wash skin
- **Remove/replace contaminated PPE or clothing**
 - Change gloves often as needed
 - Discard contaminated PPE, including shoes



Personal Hygiene

- **Shower after workshift**
- **Pay special attention when performing tasks with increased exposure potential**
 - **Wear appropriate protective clothing**
 - **Wash thoroughly after task completion**
- **Remove and clean contaminated jewelry (watches, rings)**
- **Do not eat, drink or smoke in work area**



Housekeeping

- **Good housekeeping is important to prevent dermatitis**
 - **UV materials do not dry over time/will remain on surfaces**
 - **Good housekeeping helps prevent “unknown” contact with these materials**
- **Keep surfaces and work areas clean**
- **Clean surfaces, equipment, PPE, handrails, and other common items/areas that may be contaminated**



First Aid

- **Skin contact**
 - **Remove contaminated clothing/PPE**
 - **Flush with water**
 - **Wash with mild soap and water**
 - **Hydrocortisone cream to prevent blistering**
 - **Obtain medical attention if needed**
- **Eye contact**
 - **Flush with water (15-20 minutes)**
 - **Obtain medical attention**



First Aid

- **Inhalation**
 - **Move to fresh air**
 - **Obtain emergency medical attention if needed**
- **Ingestion**
 - **Drink water (pint)**
 - **Do not induce vomiting**
 - **Obtain medical attention**



Physical Hazards

- **Most monomers, oligomers and polymers are not flammable**
- **Monomers, oligomers and polymers are reactive**
 - **Under certain conditions may result in an uncontrolled polymerization**
 - **Heat evolution, vapors**
 - **Emergency response may be needed--**
 - » **Evacuate area**
 - » **Responders should don proper PPE**
 - » **Cool container(s)**



Storage and Handling

- **Do NOT use band heaters or steam to heat or thaw material**
 - Use hot rooms or hot boxes
- **Store away from incompatible materials**
 - Peroxides, oxidizers, reducing agents, inert gases, contaminants such as iron/copper
- **Conditions to avoid--elevated temperatures, direct sunlight, localized or direct heat sources (band heaters)**



Storage and Handling

- **Maintain head space in container**
- **Check inhibitor levels**
- **Store at temperatures >50F and <100F**
 - **Between 60-80F is optimal**
- **Store indoors, away from direct sunlight, in opaque containers**
- **Prevent freezing**
- **Use within 6 months of receipt**



Disposal

- **Clean reusable drum or totes**
 - **Wear PPE**
 - **Wash container with a strong soap solution and rinse with water**
 - **If necessary use a 15% caustic solution followed by a water rinse**
- **Monomers, oligomers and polymers are generally not RCRA hazardous wastes**
 - **Possible disposal options include landfills (solids), fuel blending or incineration (liquids)**
- **Follow all federal, state, and local regulations when disposing of materials**



Conclusions

- **Monomers, oligomers and polymers are easy to handle and can be used safely in the workplace**
 - **Know the hazards, take precautions**
 - **Wear appropriate PPE**
 - **Ensure good personal hygiene and housekeeping practices are followed**



Health Effects of Additives

- **Photoinitiators**
 - **Many are powders**
 - **Dust inhalation hazard**
 - **Liquids**
 - **Contact dermatitis**
- **Additives**
 - **Adverse health effects will be noted on packaging**



Safe Handling of Additives

- **Personal protective equipment (PPE)**
 - **Safety goggles, gloves, coveralls and dust mask if needed**
- **Personal hygiene**
- **Housekeeping**
 - **Minimize dust and prevent unnecessary contact from contaminated surfaces**
- **Eliminate/control ignition sources**
 - **Bond and ground containers**
 - **Good housekeeping**



Contact information

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- **Safety CDs can also be ordered from RadTech (www.radtech.org); no cost**