

ALIPHATIC URETHANE DIMETHACRYLATE

INTRODUCTION

EBECRYL® 4859 is a difunctional aliphatic urethane methacrylate that does not contain any intentionally added organic tin compounds, heavy metals*, hydroquinone (HQ) or methyl ether of hydroquinone (MEHQ). (Please note that quinones are present in many raw materials, so the overall quinone content is reduced, but not zero in EBECRYL® 4859.) Due to a low intrinsic viscosity, EBECRYL® 4859 offers ease of formulating in energy curable systems that are low in viscosity with high oligomer content. Films of EBECRYL® 4859 cured by ultraviolet light (UV) or electron beam (EB) exhibit good hardness, optically clarity, low color and good impact resistance.

*As defined by C.O.N.E.G's Toxic in Packaging Legislation, the ASTM Standard Consumer Safety Specification on Toy Safety F 963 (ASTM F 963-08), or the EU Directive 94/62/EC (and amendments) on packaging and packaging waste.

PERFORMANCE HIGHLIGHTS

EBECRYL® 4859 is characterized by:

- No intentionally added tin, heavy metals*, or quinones
- Low viscosity
- Light color

UV/EB cured products containing EBECRYL® 4859 are characterized by the following performance properties:

- Regulation friendly for tin, heavy metals*, and quinones
- Abrasion resistance & Chemical resistance
- Flexibility
- Toughness & Impact resistance
- Excellent outdoor durability

The actual properties of UV/EB cured products also depend on the selection of other formulation components such as reactive diluents, additives and photo initiators.

SUGGESTED APPLICATIONS

Formulated UV/EB curable products containing EBECRYL® 4859 may be applied via direct or reverse roll, offset gravure, metering rod, slot die, knife over roll, air knife, curtain, immersion and spin coating methods, as well as flexographic and screen printing. EBECRYL® 4859 is recommended for:

- Applications that must meet regulations for tin, heavy metal*, and quinone content
- Ophthalmic lens casting
- Coatings on rigid and flexible plastics
- Use as a diluent for higher viscosity urethanes
- Wood coatings
- Screen inks

TYPICAL PHYSICAL PROPERTIES

| | |
|------------------------------------|--------------------------|
| Appearance | Clear liquid |
| Color, Apha | < 100 |
| Density, g/cm ³ at 25°C | 1.14 |
| Functionality, theoretical | 2 |
| HQ/MEHQ Content, ppm | < 10/< 10 ⁽¹⁾ |
| Oligomer, % by weight | 100 |
| Viscosity, 25°C, mPa.s | 10000 |

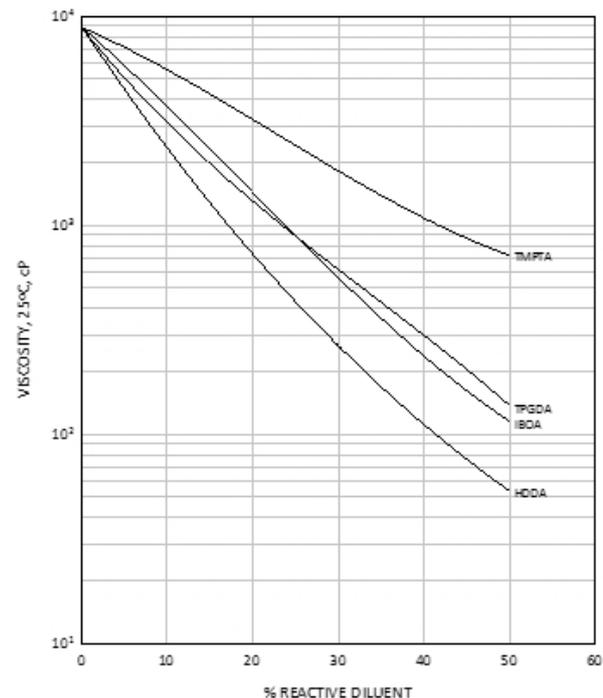
⁽¹⁾ Amount detected via HPLC with a UV detector

TYPICAL CURED PROPERTIES

| | |
|----------------------------------|---------------|
| Tensile strength, psi (MPa) | 2050 (14) |
| Elongation at break, % | 1 |
| Young's modulus, psi (MPa) | 395000 (2700) |
| Glass transition temperature, °C | 136 |

GRAPH I

EBECRYL® 4859 - VISCOSITY REDUCTION WITH REACTIVE DILUENTS



VISCOSITY REDUCTION

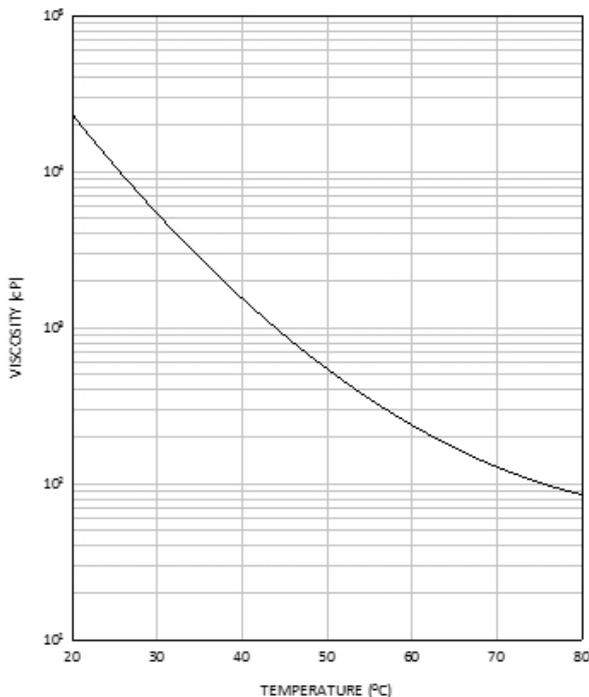
Graph I shows the viscosity reduction of EBECRYL® 4859 with 1,6-hexanediol diacrylate (HDDA)⁽²⁾, isobornyl acrylate (IBOA)⁽²⁾, tripropylene glycol diacrylate (TPGDA)⁽²⁾ and trimethylolpropane triacrylate (TMPTA)⁽²⁾. Although viscosity reduction can be achieved with non-reactive solvents, reactive diluents are preferred because they are essentially 100 percent converted during UV/EB exposure to form a part of the coating or ink, thus reducing solvent emissions. The specific reactive diluents used will influence performance properties such as hardness and flexibility.

⁽²⁾ product of allnex

Graph II illustrates the change in viscosity of EBECRYL® 4859 with increasing temperature.

GRAPH II

EBECRYL® 4859 - VISCOSITY VS. TEMPERATURE



PRECAUTIONS

Before using EBECRYL® 4859, see the Safety Data Sheet (SDS) for information on the identified hazards of the material and the recommended personal protective equipment and procedures.

STORAGE AND HANDLING

Care should be taken not to expose the product to high temperature conditions, direct sunlight, ignition sources, oxidizing agents, alkalis or acids. This might cause uncontrollable polymerization of the product with the generation of heat. Storage and handling should be in stainless steel, amber glass, amber polyethylene or baked phenolic lined containers. Procedures that remove or displace oxygen from the material should be avoided. Do not store this material under an oxygen free atmosphere. Dry air is recommended to displace material removed from the container. Wash thoroughly after handling. Keep container tightly closed. Use with adequate ventilation.

See the SDS for the recommended storage temperature range for EBECRYL® 4859.