

Technical Data

MPDiol® Glycol

Synthesis of an Orthophthalate Unsaturated Polyester Resin (UPR)

| | | | |
|-----------------------|-----------------------------------|------|------------|
| Reactor Charge | Phthalic Anhydride (PA) | 296g | 2 moles |
| | 2-Methyl-1,3-propanediol (MPDiol) | 360g | 4 moles |
| | Maleic Anhydride (MA) | 294g | 3 moles |
| | Propylene glycol (PG) | 95g | 1.25 moles |

Reactor Two liter resin reactor, heating mantle, temperature controller, mechanical agitation, steam heated reflux condenser, nitrogen bubbling.

- Procedure**
1. Add MPDiol glycol, PA, MA, and PG to the reactor.
 2. Heat at 190 - 200°C for 10 hours (until equivalent amount of water is collected) and until the final acid number has reached 20 – 30.
 3. Add 150 mg of inhibitor (hydroquinone).
 4. Cool to 140°C.
 5. Discharge and blend the resin with 600 g of cold styrene containing about 150 mg of butyl hydroquinone.

| PROPERTY | MODIFIED ORTHO | SSTANDARD ORTHO |
|-----------------------------------|------------------------|-----------------------|
| <i>TPA / MA / MPD / PG</i> | 0.8/1.2/1.6/0.5 | 0.8/1.2/--/2.1 |
| Tensile Strength (MPa) (kpsi) | 76 11 | 55 8 |
| Tensile Modulus (MPa) (kpsi) | 3725 540 | 4000 580 |
| Tensile Elongation (%) | 3.5 | 1.2 |
| Flexural Strength (MPa) (kpsi) | 138 20 | 110 16 |
| Flexural Modulus (MPa) (kpsi) | 3725 540 | 4410 640 |
| HDT (°C) (°F) | 110 230 | 110 230 |
| Water boil (% retention) | 61 | 55 |
| KOH boil (% retention) | 61 | 25 |
| HCl boil (% retention) | 52 | 50 |
| Viscosity at 45% styrene (cP) | 400 | 200 |

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Procedure for UPR Casting and Corrosion Testing

The resins were cured with 1% LUPEROX DDM-9 peroxide (MEKP, methyl ethyl ketone peroxide) a product of Atofina Chemicals, Inc., and 0.2% Cobalt Naphthenate (6% CoNap solution in mineral spirits) overnight under ambient conditions, followed by a postcure for 5 hours at 100°C. The physical properties of the cured thermosetting polymers were determined using ASTM test methods. Tensile strength, modulus, and elongation are determined using ASTM D-638, Type 1. Flexural strength and flexural modulus: ASTM D-790. DTUL: ASTM D-648. Short term environmental testing was performed by placing flexural test specimens in a sealed tube with the indicated solvent for one week at 100°C. Following the high temperature exposure the samples were removed and flexural tests were run to determine the percentage of initial flexural strength the sample retained.

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