

## Technical Data

# MPDiol® Glycol

## Synthesis of an Isophthalate Unsaturated Polyester Resin (UPR)

<b>First Stage Charge</b>	TBA Isophthalic acid (IPA)	332 g	2 moles
	2-Methyl-1,3-propanediol (MPDiol)	360 g	4 moles

<b>Second Stage Charge</b>	Maleic anhydride (MA)	294 g	3 moles
	Propylene glycol (PG)	95 g	1.25 moles

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

**Procedure** First Stage:

1. Add MPDiol glycol and IPA to the reactor.
2. Heat at 190°C for 6 hours (until equivalent amount of water is collected).
3. Cool mixture to about 120°C.

Second Stage:

4. Add MA & PG.
5. Heat at 200°C for about 10 hours (collect approximately 50 ml. of water) until the final acid number has reached 20.
6. Add 150 mg of inhibitor (hydroquinone).
7. Cool to 140°C.
8. Discharge and blend the resin with 600 g of cold styrene containing about 150 mg of butyl hydroquinone.

PROPERTY	MODIFIED ISO IPA/MPD/MA	STD ISO/PG IPA/PG/MA
Tensile Strength (MPa)	86	76
(kpsi)	12.5	11
Tensile Modulus (MPa)	3650	3800
(kpsi)	525	550
Tensile Elongation (%)	4.2	2.5
Flexural Strength (MPa)	152	138
(kpsi)	22	20
Flexural Modulus (MPa)	3930	3800
(kpsi)	570	550
HDT (°C)	91	106
(°F)	196	223
Water boil (% retention)	80	85
KOH boil (% retention)	88	50
HCl boil (% retention)	75	80
Viscosity at 45% styrene (cP)	350	300

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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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