



Diol Kuraray Polyol

Technical Information

kuraray

Contents

Products & features

Diol

- MPD : 3-methyl-1,5-pentanediol
- ND : 1,9-nonanediol

Kuraray polyol

- Polyester polyols and polycarbonate polyols
- MPD Adipate 500 – 6000 in MW
- MPD Phthalate 500 – 2000 in MW
- Di-functional and Tri-functional
- Bio-based
- ➔ Low viscosity liquid for high process efficiency
- ➔ High compatibility with other polyols for broad formulation options

Outstanding features of PUR with Kuraray polyol

- ➔ Soft & flexible
- ➔ Transparent
- ➔ High shock absorption
- ➔ Low compression & elongation set
- ➔ Grades with high and low solvent resistance
- ➔ Grades with high and low water absorption
- ➔ Excellent hydrolysis resistance
- ➔ Excellent flex fatigue at low temperature

Polyol grades vs PUR properties chart



Products & features

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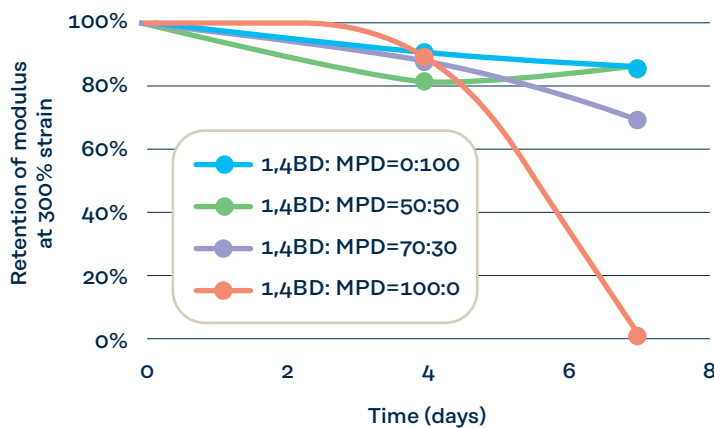
Diol

MPD : 3-methyl-1,5-pentanediol

Applications of MPD

- Polyols for Polyurethane resins & UV oligomers
- Chain extender for Polyurethane resins
- Polyester resins
- Di-acrylates
- Polymeric plasticizer
- Solvent for inks

Hydrolysis resistance of PU resin from MPD based Polyester polyol is high even MPD portion is small as an ingredient of polyester polyol.



Composition: Polyol (Mw 2000)/1,4BD/MDI=1/2/3

Polyol: (1,4BD + MPD)/adipic acid

Condition: Sheets of PU resins were soaked into water at 100°C for 7 days.
Measure modulus during the endurance test



ND : 1,9-Nonanediol

Applications of ND

- Polyols for polyurethane resins & UV oligomers
- Chain extender for polyurethane resins
- Polyester resins
- Di-acrylates

Features of pre-polymers and resins from ND

- Hydrolysis resistance
- Sharp melting point resins
- Less skin irritation in di-acrylate



Melting Point : 46°C / 115°F

Viscosity : 33 mPa.s @ 60°C / 140°F

> Same viscosity as acetone @ 20°C / 68°F

Products & features

Kuraray polyol

MPD based polyols

Polyol type	Grade	Composition	M.W.	Appearance
Polyester	P-**10	MPD adipate	500-6000	Liquid
	P-**11	MPD adipate/ terephthalate	2000	Wax
	P-**20	MPD terephthalate	500-2000	Liquid
	P-**50	MPD sebacate	2000	Liquid
	F-**10	3 functional type	500-3000	Liquid
Polycarbonate	C-**50	MPD/ HD 5:5 carbonate	2000	Liquid
	C-**90	MPD/ HD 9:1 carbonate	500-3000	Liquid

Features of MPD based polyols

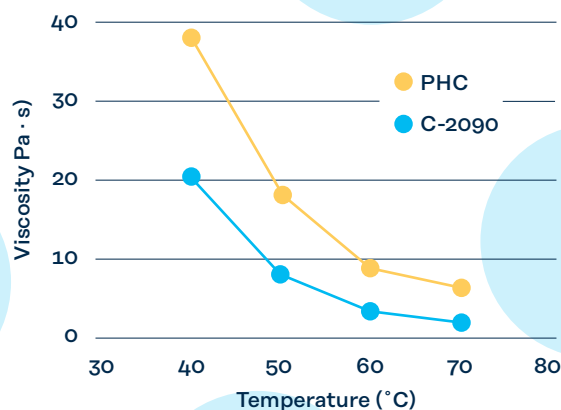
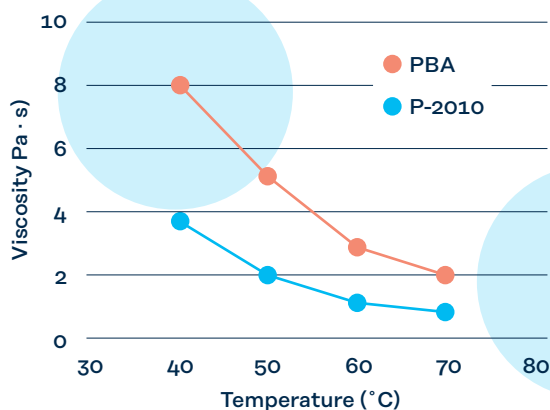
- Liquid at room temperature
- Low viscosity of polyols and pre-polymers from MPD polyols
- High compatibility with other polyols

Appearance of polyols



Viscosity of pre-polymers from different polyols

Test Method: Polyol:DMPA:IPDI = 1:1:3.15 (mole) 20 wt% in MEK



Compatibility of polyols

	PPG 2000	PTMEG 1000	PHC 2000
P-2010	+	+	++
PBA 2000	—	—	—

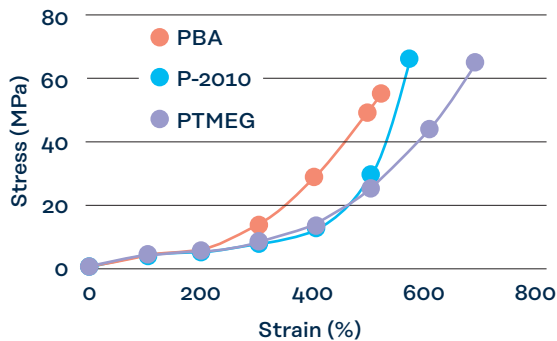
Condition: 20°C

- ++ : Clear homogenous in any rate
- + : Clear homogenous in specific rate
- : Double layer

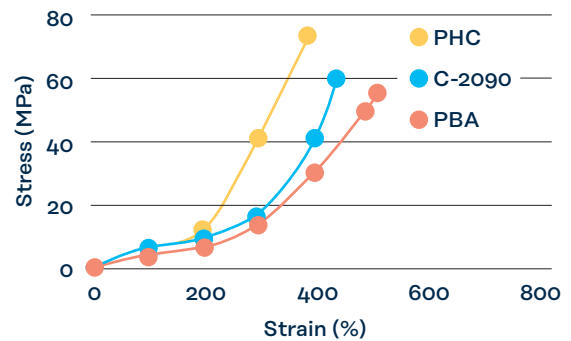
Outstanding features of PUR with Kuraray polyol



Soft & Flexible



- PU made from Kuraray polyol P-series are more flexible than ones made with conventional polyester polyols and as soft as PTMEG.



- PU made from Kuraray polyol C-series are more flexible than ones made with conventional polycarbonate polyols and as soft as PBA (polyester type).

Transparent

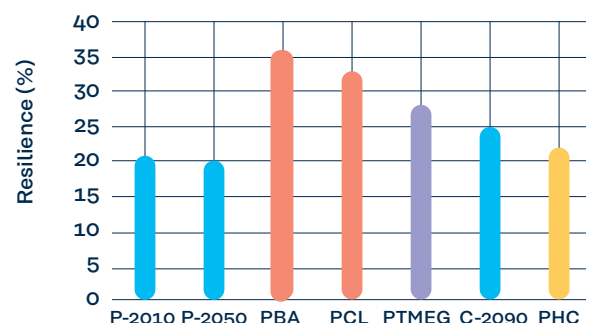
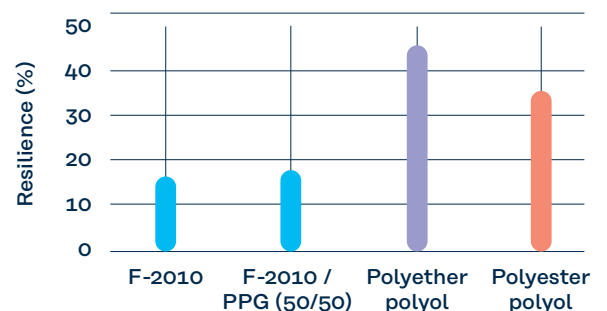


High shock absorption

Conditions : Compressed to 75% of the original thickness for 22 hr at 50°C and measured 30 minutes after removal

Sample : 12 mm thickness molded microcellular elastomer

- PUR from MPD adipate shows lower rebound compared to other polyester polyols and ether polyols.



Low elongation set

TPU : Polyol / MDI / 14BD = 1/3/2 (mole)

Elongation set 100%, 24 hours, 23°C

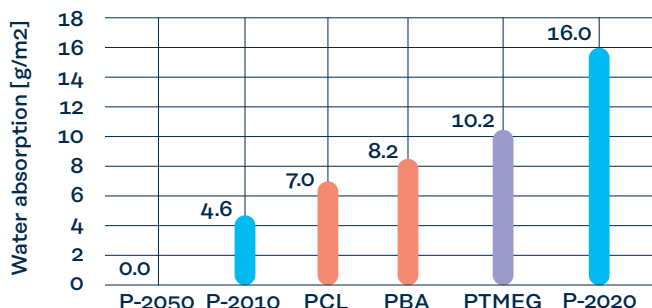
Grades with high and low solvent resistance

Polyol	PTMEG	P-2050	P-2010	PBA	PHC	P-2020
Type of Polyol	Ether	Ester	Ester	Ester	Carbonate	Ester
Weight Increase (%)	15.9	12.1	10.5	8.7	3.2	0.2

TPU : Polyol / MDI / 14BD = 1/3/2 (mole)
Weight increase (%) after immersion in IPA at R.T. for 1 day

Grades with high and low water absorption rate

Water absorption rate of PUR can be controlled by choice of MPD based polyol used

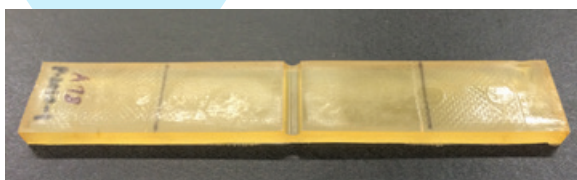


TPU : Polyol / MDI / 14BD = 1/3/2 (mole)
Water absorption of TPU, 10*20*2 mm sheet, at room temperature for 4 days

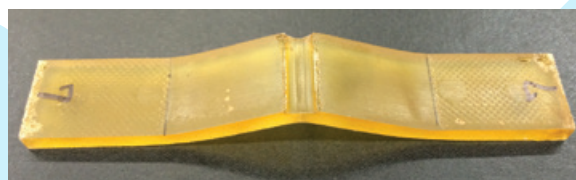
Flex fatigue properties at low temperature

Kuraray Polyol	PU bending test				
	Polyol	PU Tg (°C)	-10°C	-20°C	-30°C
	PTMEG	-75	No damage after 80k times	Crack after 80k times	Crack after 80k times
	PBA	-45	No damage after 80k times	Crack after 80k times	Crack after 80k times
	PHC	-18	Break after 40k times	Break after 20k times	Break after 20k times
	P-2010	-41	No damage after 80k times	No damage after 80k times	No damage after 80k times
	C-2050	-15	No damage after 80k times	No damage after 80k times	No damage after 80k times
	C-2090	-15	No damage after 80k times	Break after 20k times	Break after 20k times

TPU : Polyol (MW=2000)/MDI/14BD=1/3/2 (mole)



P-2010 kept the same shape after 80k bending times at -20°C.



PBA changed shape after 80k bending times at -20°C.

PUR with Kuraray polyol

Polyol grades vs PUR properties chart

● Ether polyol

▲ Ester polyol

■ PCD

Kuraray polyol

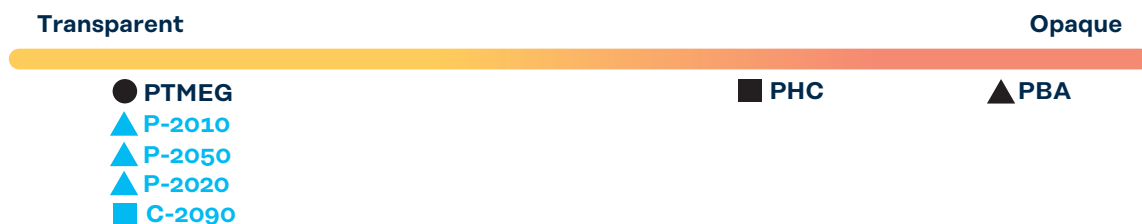
Soft & flexible



Flex fatigue properties at low temperature



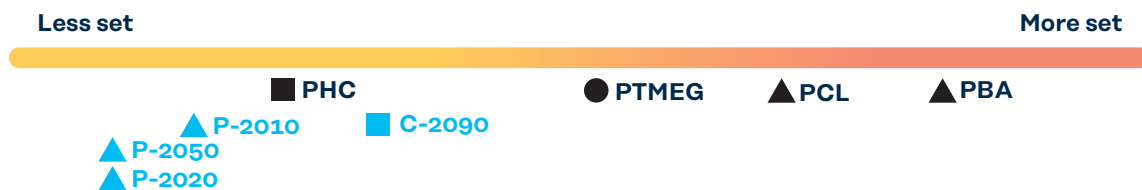
Transparency



Shock absorption



Elongation set



Compression set



Solvent resistance (absorption of IPA)



Water absorption

More absorb

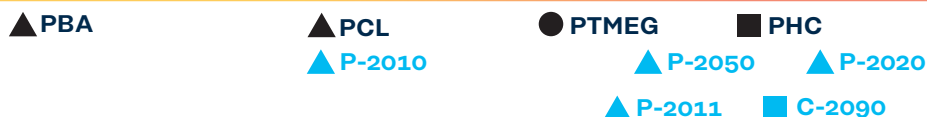
Less absorb



Water resistance

Less durable

More durable



Adhesion to PET resin

Less strong

More strong



Abbreviations

1,4BD : 1,4-butanediol
HD : 1,6-hexanediol
EO-PPG : Ethylene oxide capped PPG
PTMEG : poly tetramethylene glycol

PBA : poly (1,4-butylene adipate)-diol
PCL : poly caprolactone diol
DEG/TMP-AA : poly (diethylene glycol, trimethylolpropane adipate)-triol
PHC : poly (1,6-hexane carbonate)-diol

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