Diol
Kuraray Polyol

Technical Information

kuraray

Rev 07/2023

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

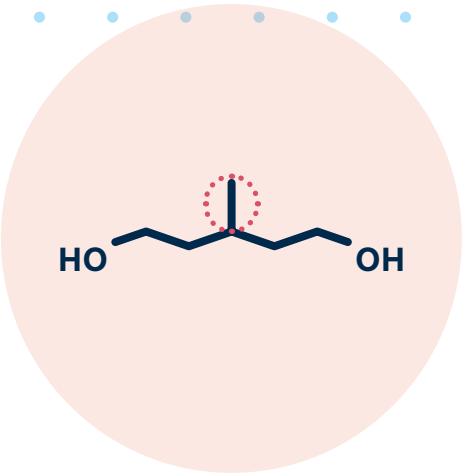
Products & features

Diol

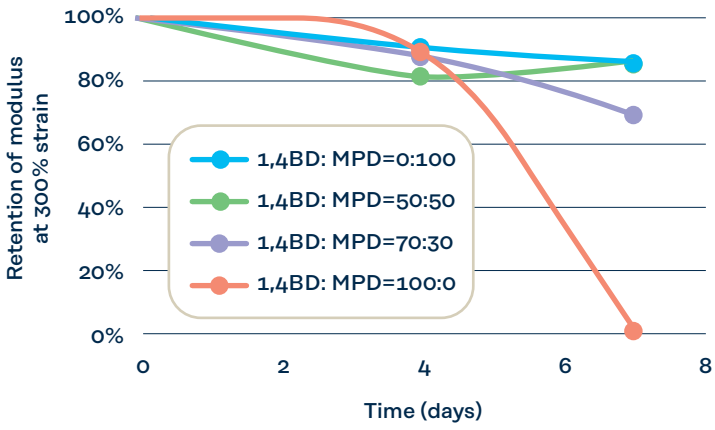
MPD : 3-methyl-1,5-pentanediol

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

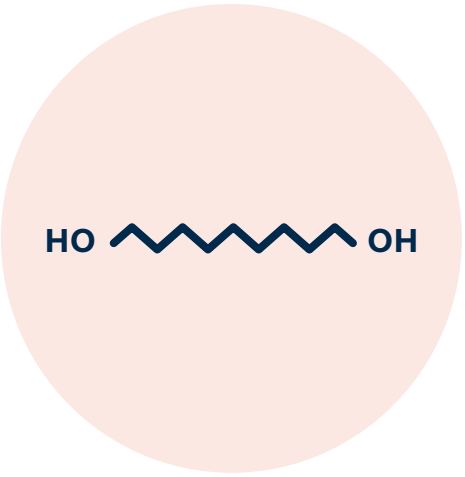
Polyol: (**1,4BD + MPD**)/adipic acid

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

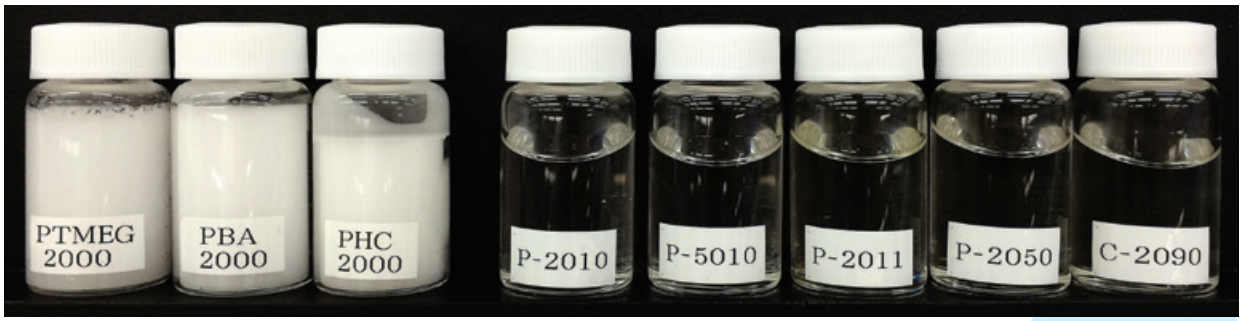
Polyol type	Grade	Composition	M.W.	Appearance
Polyester	P-**10	MPD adipate	500-6000	Liquid
	P-**11	MPD adipate/ terephthalate	2000	Wax
	P-**20	MPD terephthalate	500-2000	Liquid
	P-**50	MPD sebacate	2000	Liquid
	F-**10	3 functional type	500-3000	Liquid
Polycarbonate	C-**50	MPD/ HD 5:5 carbonate	2000	Liquid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

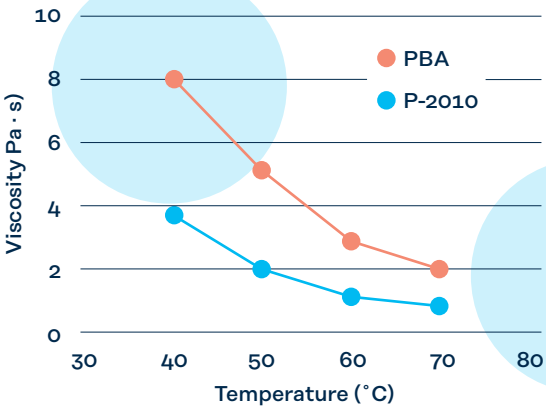
Appearance of polyols

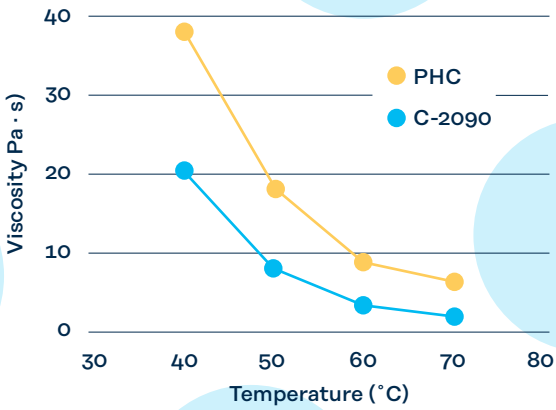
Conventional polyols	Kuraray polyol



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

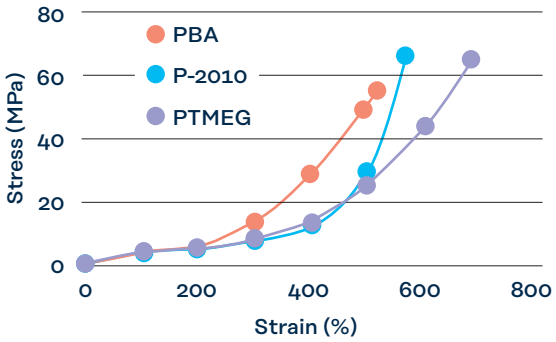
++ : Clear homogenous in any rate

\+ : Clear homogenous in specific rate

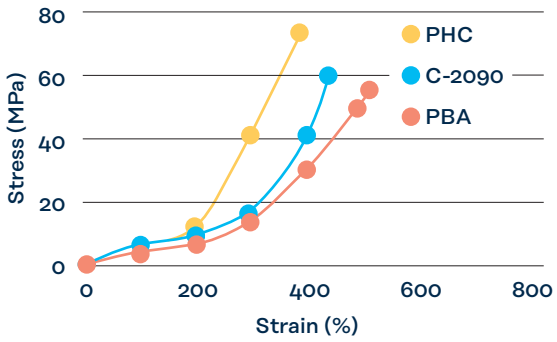
— : Double layer

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).

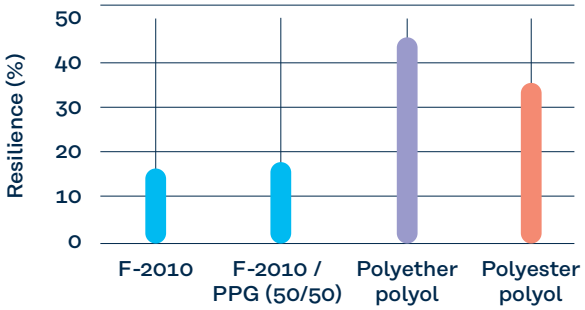
Transparent

Conditions: PU composition (Polyol / HDI isocyanurate =1 /1, film thickness = 2 mm

High shock absorption

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

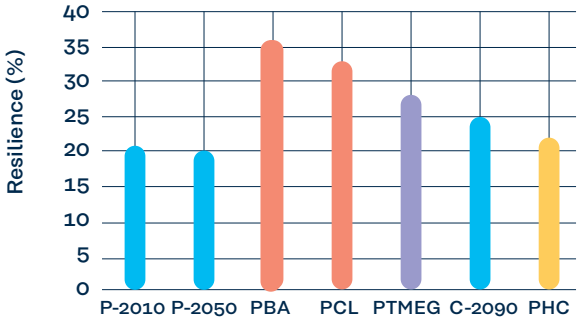
Sample : 12 mm thickness molded microcellular elastomer



- 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



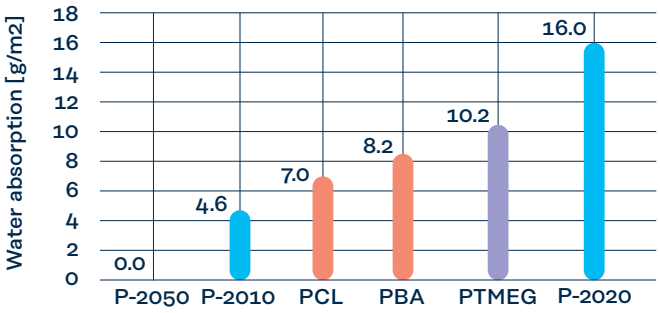
Grades with high and low solvent resistance

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

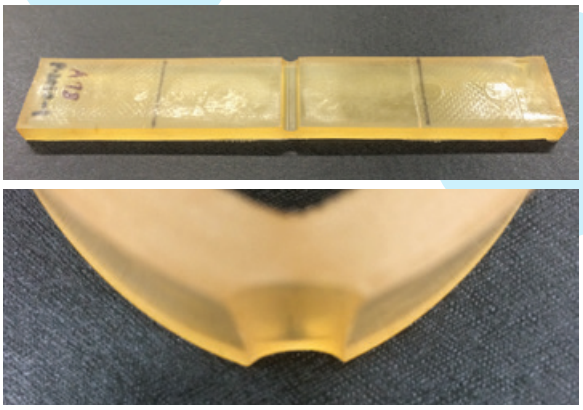


TPU : Polyol / MDI / 14BD = 1/3/2 (mole)
Water absorption of TPU, 10*20*2 mm sheet, at room temperature for 4 days

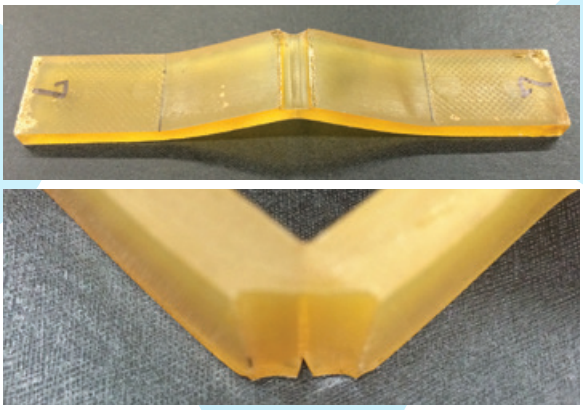
Flex fatigue properties at low temperature

	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
Kuraray Polyol	P-2010	-41	No damage after 80k times	No damage after 80k times	No damage after 80k times
Kuraray Polyol	C-2050	-15	No damage after 80k times	No damage after 80k times	No damage after 80k times
Kuraray Polyol	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.



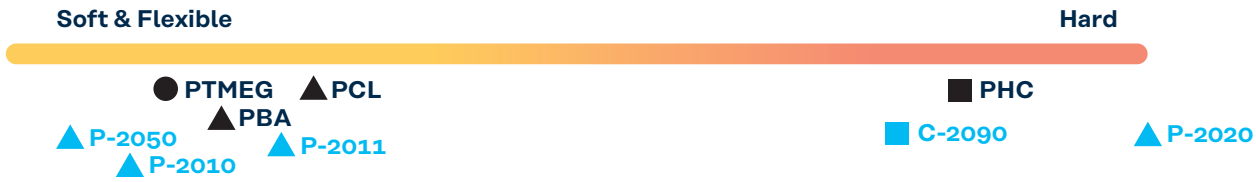
PBA changed shape after 80k bending times at -20°C.

PUR with Kuraray polyol

Polyol grades vs PUR properties chart

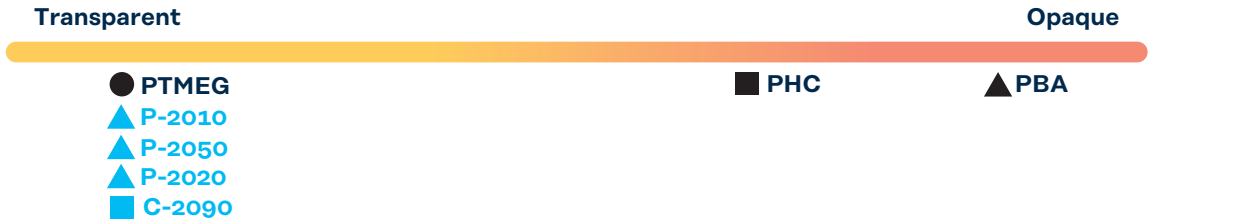
● Ether polyol
▲ Ester polyol
■ PCD
Kuraray polyol

Soft & flexible



Flex fatigue properties at low temperature

Transparency



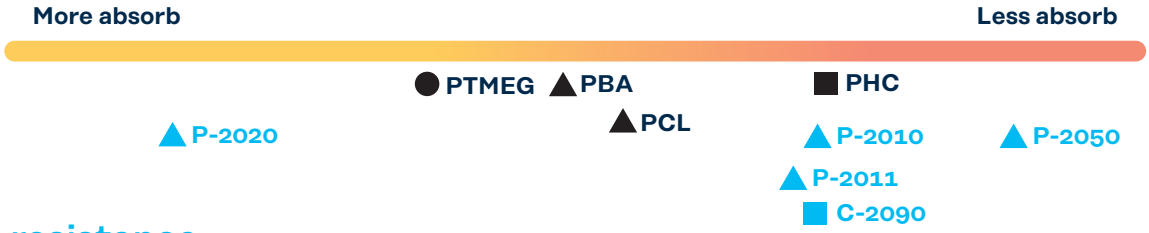
Shock absorption

Elongation set

Compression set

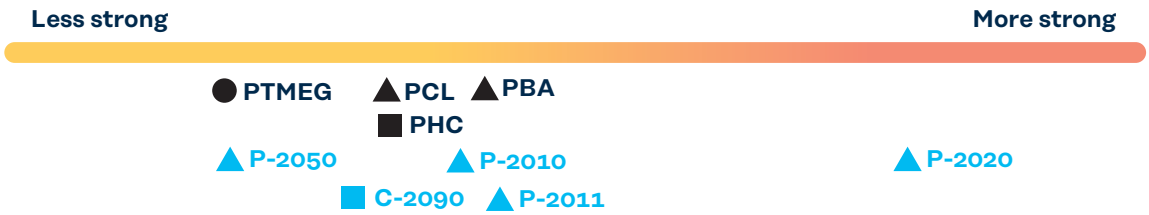
Solvent resistance (absorption of IPA)

Water absorption



Water resistance

Adhesion to PET resin



Abbreviations

14BD	: 1,4-butanediol	PBA	: poly (1,4-butylene adipate)-diol
HD	: 1,6-hexanediol	PCL	: poly caprolactone diol
EO-PPG	: Ethylene oxide capped PPG	DEG/TMP-AA	: poly (diethylene glycol, trimethylolpropane adipate)-triol
PTMEG	: poly tetramethylene glycol	PHC	: poly (1,6-hexane carbonate)-diol

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