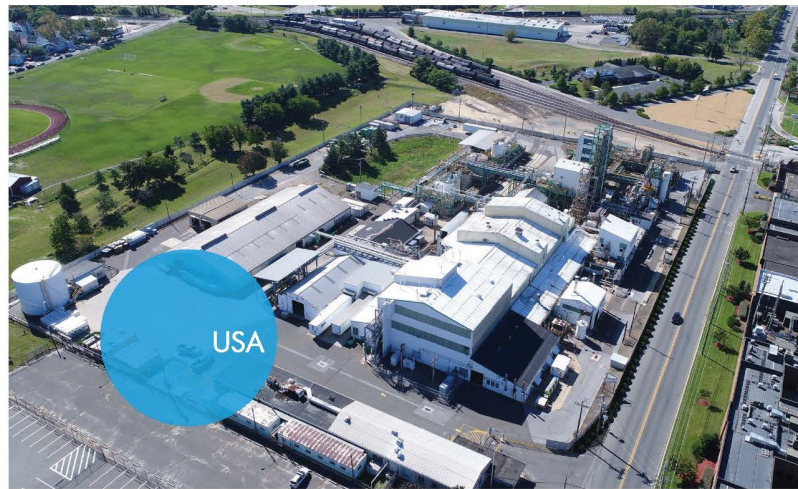




Imuthane

Hot Cast Polyurethane Prepolymers





Quality hot cast elastomers, customized to your needs

Creating the right chemistry for your performance products

Imuthane castable polyurethane prepolymers provide processors with a customizable, quality product that meets the needs of end-use applications, either on a great or small scale. Whatever your specific requirements, we can tailor our high-performance Imuthane Prepolymers to help ensure that your products have superior abrasion resistance, high tear strength, and excellent load bearing ability.

Imuthane Prepolymers are designed for hot cast processing and available in a full range of chemistries. During the manufacturing process, Imuthane Prepolymers facilitate the production of high-quality parts by providing you with outstanding reliability through:

- ▶ Stable viscosity
- ▶ Batch-to-batch consistency
- ▶ Excellent heat stability
- ▶ Good color

Building in flexibility and strength for exceptional durability

The resultant cured elastomers developed from our Imuthane Prepolymers are created to withstand even the most abrasive, flex and wear environments. Your products will have the advantage of exceptional physical properties:

- ▶ Tight reproducible durometers
- ▶ High performance under wear
- ▶ Flex fatigue resistance
- ▶ Excellent toughness with superior resistance to cut and tear

These durable elastomers are used in a variety of applications including tires and wheels, rolls and rollers, mining equipment, grain handling equipment, squeegees, hammers, mallets, bushings, gears, and many more.

Coim also manufactures a complete range of ester and other Imuthane quasi-systems for use in a wide variety of demanding applications.

With Imuthane Prepolymers, our *Advanced Thinking* goes into every one of your product.



IMUTHANE COMPOSITE DATA SHEET



MDI Polyester series

MDI polyether series

	17-85A	17-91A	17-95A	17-90A	18-96A	27-85A	27-90A	27-95A	27-53D
Typical Prepolymer Properties									
% NCO	6.5 - 6.9	7.9 - 8.3	9.3 - 9.7	7.5 - 7.9	8.3 - 8.7	6.1 - 6.5	7.2 - 7.6	8.7 - 9.1	11.0 - 11.4
Viscosity cPs @ 100°C	700	600	400	800	500(@ 85°C)	775	575	450	200
Specific Gravity									
@ 25°C	1.22	1.22	1.18	1.21		1.06	1.05	1.02	1.10
@100°C	1.20	1.2	1.15	1.16	1.15	1.01	1.01	1.01	1.05
Typical Process Conditions									
IMUTHANE °C	93	93	93	93	85	82	82	82	77
BDO, °C	25	25	25	25	45	25	25	25	25
Mold, °C	115	115	115	115	90 - 110	115	115	115	115
% Theory	95	95	95	95	95	95	90	95	95
Pot Life, min	6	5	3.5	6	5 - 8	8	5	3	3
Cure Time, min @ °C	60 @ 115	60 @ 115	60 @ 115	60 @ 115	60 @ 100-110	60 @ 115	60 @ 115	60 @ 115	60 @ 115
Post Cure, hrs @ °C	16 @ 115	16 @ 115	16 @ 115	16 @ 115	24 @ 100-110	16 @ 115	16 @ 115	16 @ 115	16 @ 115
Typical Physical Properties									
Shore Hardness	85A	91A	95A	90A	95A	85A	90A	95A	53D
100% Modulus, psi (MPa)	850 (5.9)	1200 (8.3)	2000 (8.3)	1125 (7.7)	2730 (18.8)	900 (6.2)	1200 (8.3)	1350 (9.3)	2650 (18.3)
300% Modulus, psi (MPa)	1850 (12.8)	2400 (16.5)	3800 (16.5)	2000 (13.8)	3772 (26)	1850 (12.8)	2300(15.8)	2650 (18.3)	3800 (26.2)
Tensile, psi (MPa)	6800 (46.9)	6700 (46.2)	6100 (46.2)	5800 (40.0)	7600 (52)	4200 (29.0)	4900 (33.8)	6000 (41.4)	6000 (41.4)
Elongation, %	575	575	450	400	480	450	450	475	325
Tear Strength, Die C, pli (kN/m)	550 (96.3)	650 (113.8)	750 (113.8)	525 (91.9)	503 (88)	350 (61.3)	550 (96.3)	500 (87.5)	550 (96.3)
Tear Strength, (D470), pli (kN/m)	120 (21.0)	175 (30.6)	210 (30.6)	100 (17.5)		70 (12.3)	130 (22.7)	160 (28.0)	150 (26.3)
Bashore Rebound, %	40	30	29	40	48	68	62	60	36
Compression Set, Method B,	35	25	30	30	22(ISO 815-1)	25	20	30	
Specific Gravity	1.23	1.23	1.21	1.24	1.23	1.09	1.10	1.11	1.11

The data obtained herein are believed to be reliable. However, there is no guarantee that the same results will be obtained under different conditions. Fit for use testing should be conducted by each user.

IMUTHANE COMPOSITE DATA SHEET



TDI Polyether series

	22-83A	22-90A	23-90A	22-93A	22-95A	22-58D	22-74D	23-75D
Typical Prepolymer Properties								
% NCO	3.1 - 3.5	4.0 - 4.4	4.0 - 4.4	5.3 - 5.7	6.1 -6.5	7.3 - 7.7	9.3 -9.7	9.3 - 9.7
Viscosity cPs @ 100 °C	650	550	550	350	300	200	250	200
Specific Gravity								
@ 25 °C	1.04	1.06	1.04	1.06	1.07	1.09	1.12	1.13
@100 °C	1.00	1.00	1.01	1.01	1.01	1.03	1.06	1.06

Typical Process Conditions								
IMUTHANE °C	100	100	100	82	82	70	70	70
MOCA, °C	115	115	115	115	115	115	115	115
Mold, °C	100	100	100	100	100	100	100	100
% Theory	95	95	95	90	95	95	95	95
Pot Life, min	14	10	8	7	5	5	3	2
Cure Time, min @ °C	60 @ 100	60 @ 100	30 @ 100	60 @ 100	60 @ 100	60 @ 100	60 @ 100	60 @ 100
Post Cure, hrs @ °C	16 @ 70	16 @ 70	16 @ 70	16 @ 70	16 @ 70	16 @ 100	16 @ 100	16 @ 100

Typical Physical Properties								
Shore Hardness	83A	90A	90A	93A	95A	59D	75D	75D
100% Modulus, psi (MPa)	825 (5.7)	1100 (7.5)	1100 (7.5)	1600 (11.0)	1900 (13.0)	3250 (22.4)	5300 (36.5)	5000 (34.4)
300% Modulus, psi (MPa)	1500 (10.3)	2150 (14.8)	2150 (14.8)	3300 (22.7)	4000 (27.5)	6800 (46.9)	- (-)	- (-)
Tensile, psi (MPa)	4700 (32.4)	5000(34.5)	5000(34.5)	6000 (41.3)	5500 (37.9)	7200 (49.6)	7300 (50.3)	6000 (41.4)
Elongation, %	480	450	450	400	400	300	250	200
Tear Strength, Die C, pli (kN/m)	350 (61.3)	400 (70.0)	400 (70.0)	550 (96.3)	550 (96.0)	600 (105.1)	1050 (183.8)	1100 (192.6)
Tear Strength, (D470), pli (kN/m)	65 (11.3)	80 (14.0)	80 (14.0)	110 (19.2)	140 (24.5)	110 (19.3)	125 (21.9)	120 (21.0)
Bashore Rebound, %	63	45	45	48	40	45	53	55
Compression Set, Method B,	25	30	30	32	38	40	-	10
Specific Gravity	1.07	1.10	1.10	1.13	1.13	1.14	1.20	1.13

The data obtained herein are believed to be reliable. However, there is no guarantee that the same results will be obtained under different conditions. Fit for use testing should be conducted by each user.

IMUTHANE COMPOSITE DATA SHEET



Medium performance TDI Polyether series

	32-80A	32-85A	32-91A	32-90A	32-93A	32-95A	32-75D
Typical Prepolymer Properties							
% NCO	3.3 - 3.5	4.0 - 4.4	4.5 - 4.9	5.3 - 5.7	6.1 - 6.5	5.8 - 6.2	6.5 - 6.9
Viscosity cPs @ 100 °C	375	350	200	175	115	125	450
Specific Gravity							
@ 25 °C	1.07	1.07	1.07	1.08	1.08	1.08	1.08
@100 °C	1.01	1.01	1.01	1.02	1.02	1.02	1.02

Typical Process Conditions							
IMUTHANE °C	82	71	71	66	60	60	71
MOCA, °C	115	115	115	115	115	115	115
Mold, °C	100	100	100	100	100	100	100
% Theory	90	90	95	90	90	90	90
Pot Life, min	15	10	6	5	4	4	3
Cure Time, min @ °C	60 @ 100	60 @ 100	60 @ 100	60 @ 100	60 @ 100	60 @ 100	60 @ 100
Post Cure, hrs @ °C	16 @ 70	16 @ 70	16 @ 70	16 @ 70	16 @ 70	16 @ 70	16 @ 70

Typical Physical Properties							
Shore Hardness	80A	85A	91A	90A	93A	95A/48D	75D
100% Modulus, psi (MPa)	600 (4.1)	750 (5.2)	1150 (7.9)	1200 (8.3)	1500 (10.3)	1850 (10.3)	4450 (30.7)
300% Modulus, psi (MPa)	1000 (6.9)	1300 (9.0)	1550 (10.7)	2200 (15.2)	2500 (17.2)	3400 (17.2)	-
Tensile, psi (MPa)	2000 (13.5)	3000 (20.6)	3400 (23.4)	3300 (22.8)	4000 (27.6)	4700 (27.6)	5900 (40.7)
Elongation, %	600	500	475	375	400	325	275
Tear Strength, Die C, pli (kN/m)	200 (35.0)	250 (43.8)	300 (52.5)	350 (61.3)	375 (65.7)	450 (65.7)	950 (166.3)
Tear Strength, (D470), pli (kN/m)	60 (10.5)	65 (11.4)	70 (12.2)	70 (12.3)	80 (14.0)	120 (14.0)	170 (29.8)
Bashore Rebound, %	25	30	34	30	30	48	45
Compression Set, Method B,	35	40	38	40	40	35	-
Specific Gravity	1.12	1.12	1.12	1.13	1.13	1.13	1.15

The data obtained herein are believed to be reliable. However, there is no guarantee that the same results will be obtained under different conditions. Fit for use testing should be conducted by each user.

IMUTHANE COMPOSITE DATA SHEET



Low Free TDI ether series

	PHP70A	PHP80A	PET80A	PET85A	PET90A	PET93A	PET95A	PET60D	PHP70D	PET75D	PHP80D
Typical Prepolymer Properties											
% NCO	2.1	2.8	2.7	3.4	3.65	5.2	6.25	7.3	8.3	9.15	11.1
Viscosity cPs @ 40°C	4,000	4,000	7,500	4,550	3,950	2,900	2,000	2,100	3,000	3,050	6,750
Viscosity cPs @ 70°C	900	950	2,000	1,100	1,000	625	425	400	500	400	650
Specific Gravity @ 70°C			0.98	0.99	1.00	1.02	1.03	1.05	1.07	1.07	
Residual TDI (%)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Typical Process Conditions											
IMUTHANE	70	70	90	85	80	75	70	70	70	70	70
MOCA, °C	115	115	115	115	115	115	115	115	115	115	115
Mold, °C	100	100	100	100	100	100	100	100	100	100	100
% Theory	95	95	95	95	95	95	95	95	95	95	95
Pot Life, min	38.5	20	15	12	10	7	6	5	3	2.5	1.5
Cure Time, min @ °C	120 @ 100	120 @ 100	90 @ 100	60 @ 100	30 @ 100	20 @ 100	15 @ 100	12 @ 100	10 @ 100	10 @ 100	15 @ 100
Post Cure, hrs @ °C	18 @ 100	16 @ 100	15 @ 100	15 @ 100	15 @ 100	15 @ 100	15 @ 100	15 @ 100	15 @ 100	15 @ 100	16 @ 100

Typical Physical Properties											
Shore Hardness	70A	80A	80A	85A	89A	93A	95A	60D	70D	75D	80D
100% Modulus, psi (MPa)	350 (2.4)	675(4.6)	600 (4.1)	800 (5.5)	1,100 (7.6)	1,600 (11.0)	2,400 (16.5)	3,100 (21.4)	4,100 (28.3)	6,400(44.1)	6,900 (47.5)
300% Modulus, psi (MPa)	550 (3.8)	1,050 (7.2)	1,200 (8.3)	1,300 (9.0)	1,300 (9.0)	2,900 (20.0)	5,100 (35.2)				
Tensile, psi (MPa)	1300 (9.0)	3,300 (22.6)	5,000 (34.5)	3,200 (22.1)	3,000 (20.7)	5,500 (37.9)	7,200 (49.6)	8,700 (60.0)	10,400 (71.7)	9,500(65.5)	9,300 (64.1)
Elongation, %	650	575	550	540	530	380	350	280	280	180	175
Tear Strength, Die C, pli (kN/m)	200 (35)	300 (53)	350 (61)	340 (60)	450 (79)	410 (72)	650 (114)	880 (154)	790 (138)	1,100(193)	1,100 (193)
Tear Strength, (D470), pli (kN/m)	30	60 (11)	70 (12)	40 (7)	70 (12)	80 (14)	100 (18)	120 (21)	110 (19)	110(19)	120 (21)
Bashore Rebound, %	60	60	53	62	59	52	46	50	64	63	66
Compression Set, Method B, %	25	30	17	22	19	25	25	4.8 *	1.4 *	1.8*	
Specific Gravity			1.07	1.06	1.06	1.11	1.13	1.16	1.18	1.19	

The data obtained herein are believed to be reliable. However, there is no guarantee that the same results will be obtained under different conditions. Fit for use testing should be conducted by each user.

* Compression Set (%) Method A : 1,350 psi (9.3MPa), 22 hours at 70°C

IMUTHANE COMPOSITE DATA SHEET



Low Free TDI ester series

	PST70A	PST80A	PST85A	PST90A	PST95A
Typical Prepolymer Properties					
% NCO	2.25	3.1	3.6	4.4	5.1
Viscosity cPs @ 50 °C	11,750	8,000	6,800	6,750	6,550
Viscosity cPs @ 70 °C	3,750	2,350	1,850	1,775	1,750
Specific Gravity @ 70 °C		1.14	1.15	1.15	
Residual TDI (%)	< 0.1	< 0.1	< 0.1	<0.1	< 0.1

Typical Process Conditions					
IMUTHANE °C	85	85	85	85	85
MOCA, °C	115	115	115	115	115
Mold, °C	100	100	100	100	100
% Theory	95	95	95	95	95
Pot Life, min	14	13	8	7	3-4
Cure Time, min @ °C	60 @ 100	60 @ 100	30 @ 100	15 @ 100	30 @ 100
Post Cure, hrs @ °C	15 @ 100	15 @ 100	15 @ 100	15 @ 100	16 @ 100

Typical Physical Properties					
Shore Hardness	72A	80A	85A	90A	95A
100% Modulus, psi (MPa)	400 (2.8)	600 (4.1)	1,000 (6.9)	1,100 (7.6)	1,500 (10.3)
300% Modulus, psi (MPa)	600 (4.1)	1,400 (9.7)	1,800 (12.4)	2,000 (13.8)	2,200 (15.2)
Tensile, psi (MPa)	6,000 (41.4)	8200 (56.5)	7,800 (53.8)	7,900 (54.5)	9,000 (62.1)
Elongation, %	800	650	580	530	550
Tear Strength, Die C, pli (kN/m)	280 (49)	430 (75)	570 (100)	610 (107)	650 (114)
Tear Strength, (D470), pli (kN/m)	70 (12)	105 (18)	125 (22)	145 (25)	190 (33)
Bashore Rebound, %	40	35	36	25	36
Compression Set, Method B, %	40	25	30	20	35
Specific Gravity		1.26	1.26	1.26	

Low Free TDI prepolymer Features

- Free, unreacted TDI monomer < 0.1%
- Lower viscosity
- Longer potlife
- Shorter demold time
- Slower rate of increase in viscosity of reaction mixture
- Narrow molecular weight distribution
- Superior dynamic property
- High load-bearing capability
- Improved high-temperature performance

The data obtained herein are believed to be reliable. However, there is no guarantee that the same results will be obtained under different conditions. Fit for use testing should be conducted by each user.

Special Products

Product	Description
13-90A	Excellent solvent resistance. For metal coating roll
18Q	MDI polyester quasi. Hardness from 55 to 95 Shore A

Hardness formulation for Imuthane 13-90A				
Hardness	55A	45A	30A	85-90A
Imuthane 13-90A	100	100	100	100
Benzoflex 988SG	0	25	50	-
Imucure GR91 (Isonol 93 or Polyol TP30)	%NCOx2.06	%NCOx2.06	%NCOx2.06	GR 133 : %NCO x 3.02
Imuthane 13-90A	100oC	100oC	100oC	93°C
Benzoflex 988SG	Room Temp	Room Temp	Room Temp	-
Imucure GR91 (Isonol 93 or Polyol TP30)	Room Temp	Room Temp	Room Temp	GR 133 : 115°C
Cure temp (°C)	120	120	120	100
Cure time (hrs)	16	16	16	0.5

Typical Physical Properties				
Shore Hardness	55A	45A	30A	92A
100% Modulus, psi (MPa)	300 (2.0)	195 (1.3)	100 (0.69)	1030 (7.1)
300% Modulus, psi (MPa)	800 (5.5)	490 (3.4)	250 (1.72)	1800 (12.4)
Tensile, psi (MPa)	3900 (26.9)	1900 (13.0)	750 (5.2)	8500 (58.6)
Elongation, %	590	460	500	575
Tear Strength, Die C, pli (kN/m)	190 (33.3)	140 (24.5)	90 (15.7)	550 (96.3)
Tear Strength, (D470), pli (kN/m)	18 (3.2)	9 (1.6)	8 (1.4)	170 (29.7)
Bashore Rebound, %	10	17	22	28
Specific Gravity	1.25	1.22	1.21	1.25

%NCO is measured during QC. It is labelled outside our pail

Alternatively, a 3/1 by weight blend of TMP/TIPA, TMP, Isonol 93 or Polyol TP30 can be used as the curing agent.

Technical Information

The Imuthanes are isocyanate terminate prepolymers that are designed to produce high-performance polyurethane elastomers. These elastomers exhibit superior abrasion resistance, high tear strength, excellent load bearing ability, and good toughness. The types of Imuthane available are both TDI and MDI with polyester, polyether, and polycaprolactone. These types are:

First Digit	Second Digit
1 - Ester	2 - TDI
2 - PTMEG	7 - MDI
3 - PPG	
4 - Polycaprolactone	
Third & Fourth Digit - Hardness	

Also available are custom developed materials specific to your needs.

Processing Guide

Melt Procedure For Imuthane Prepolymers

Imuthane Prepolymers are both liquids and solids depending on the type. Solid prepolymers and those liquids that were exposed to cold temperatures and frozen can be safely melted by using warming devices such as ovens, warming blankets, and drum heaters. Caution should be taken so as not to cause localized overheating. The time it takes to melt a solid Imuthane localized overheating. The time it takes to melt a solid Imuthane Prepolymer is as follows:

With a warming temperature of 60 C (140 F):

1 gallon can	1-2 hours
5 gallon can	7-9 hours
55 gallon drum	35-40 hours

To ensure homogeneity after melting, the containers should be rolled. Original unopened containers do not need to be vented prior to melting. If vented, however, a drying tube with a moisture indicator should be used to prevent moisture contamination. Moisture contamination can cause a loss of NCO. reactivity, stability and mechanical properties of the final elastomer.

Calculation for the Amount of Curative

To calculate the desired amount of any curative for any Imuthane Prepolymer, the following formula may be used:

$$\frac{(\%NCO) (eq.wt \text{ curative}) (\% \text{ theory})}{4202}$$

=Amount of curative per 100 parts of Imuthane Prepolymer

Example: IMUTHANE NCO = 4.2%

$$\text{Curative} = \text{MBOCA eq.wt} = 133.5$$

$$\% \text{ theory} = 90$$

$$\frac{(4.2)(133.5)(90)}{4202}$$

=12 Parts MBOCA per 100 Parts Imuthane Prepolymer

Equivalent weights of some typical curatives

1,4 Butanediol	45	Lonzacure M-CDEA	188.6
DEG	53	PDEA	90.6
Ethacure 100 (DETDA)	89	1.3 Propapediol	38
Ethacure 300	107	TIPA	63.7
1,6 Hexanediol	59	TMP	44.7
HQEE	99	Voranol 234-630	91

TOXICITY

Imuthanes are isocyanate terminated prepolymers, and as such should be handled with care. Avoid breathing of vapors and skin contact. Use proper ventilation and PPE. MSDS's are available for each product and should be consulted before using any Imuthane.

Imuthanes

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