



MEDICAL TPU
SOLVENT EFFECTS
& CHEMICAL
RESISTANCE
OVERVIEW

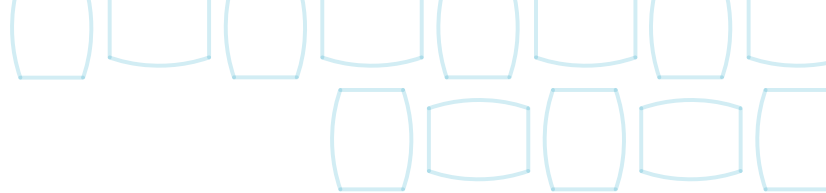
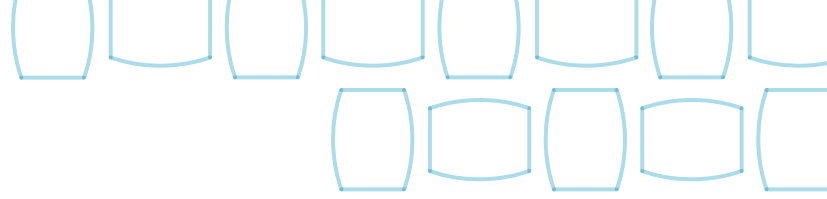


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Solvent Effects Overview

Solvent effects are an important area of interest in the development and use of polymers.

Solvents are used to:

- Dissolve polymer to create device components
- Coat devices to give them desired properties
- Clean and disinfect components in manufacturing and through use of device

Solvent interactions also determine material transportation through the polymer. An understanding of the effects of solvents on polymers allows for the optimization of design and processing conditions, as well as selection of a suitable solvent.

In this study, the effect of solvent absorption was studied by placing small cut pieces of injection molded bars into 20ml scintillation vials and filled with solvent. The samples were stored at room temperature (approximately 23°C) for 24 hours. Samples were then removed, wiped gently and weighed immediately. The results note the weight percentage of solvent the resin absorbed in 24 hours.



Solvent Absorption

Aliphatic Carbothane™ TPU

24 hours @ 23°C, ASTM-D 570

Solvent, TPU	PC-3575A	PC-3585A	PC-3595A	PC-3555D	PC-3572D
% wt Increase					
Acetonitrile	65	50	35	30	18
Acetone	175	100	80	60	45
Caster Oil	0	0	0	0	0
Chloroform	D	D	D	D	PD
Cyclohexane	2	1	1	1	0
Cyclohexanone	PD	PD	100	70	60
Cyclopentanone	PD	PD	PD	125	95
Diethylether	25	20	16	16	9
Dimethylacetamide	D	D	PD	PD	PD
Dimethylformamide	PD	PD	PD	PD	PD
Dimethylsulfoxide	40	45	45	45	65
Dioxane	PD	PD	PD	200	125
Ethanol	6	6	6	5	6
Ethylacetate	200	125	80	60	40
Hexane	1	1	1	1	1
Isopropyl alcohol	3	3	3	3	3
Methanol	8	9	9	7	9
Methylene Chloride	D	PD	775	1150	600
Methyl Ethyl Ketone	300	150	100	80	55
Tetrahydrofuran	D	PD	PD	PD	275
Toluene	450	175	100	80	55
Trichloroethane	D	PD	PD	PD	PD
Normal Saline (0.9% Sodium Chloride)	0	0	0	0	0
1N HCl (Hydrochloric Acid)	0	0	0	0	0
1N NaOH (Sodium Hydroxide)	0	0	0	0	0
PEG 300	0	0	0	0	0
PolyPropylene Glycol	0	0	0	0	0
Polysorbate - 80	0	0	0	0	0

PD = Partially Dissolved
D = Completely Dissolved

Solvent Absorption

Aliphatic Carbothane™ TPU (continued)

24 hours @ 23°C, ASTM-D 570

Solvent, TPU	PC-3575A-B20	PC-3585A-B20	PC-3595A-B20	PC-3555D-B20	PC-3572D-B20
% wt Increase					
Acetonitrile	55	40	30	25	16
Acetone	175	90	65	55	35
Caster Oil	0	0	0	0	0
Chloroform	D	D	D	D	PD
Cyclohexane	1	1	1	1	0
Cyclohexanone	PD	PD	95	60	55
Cyclopentanone	PD	PD	PD	125	85
Diethylether	19	16	12	11	8
Dimethylacetamide	D	D	PD	PD	PD
Dimethylformamide	PD	PD	PD	PD	PD
Dimethylsulfoxide	30	35	40	40	45
Dioxane	PD	PD	PD	175	125
Ethanol	4	5	5	5	5
Ethylacetate	175	85	60	60	35
Hexane	1	1	1	0	0
Isopropyl alcohol	2	3	2	2	2
Methanol	7	7	7	9	7
Methylene Chloride	D	PD	700	1175	600
Methyl Ethyl Ketone	300	125	90	80	60
Tetrahydrofuran	D	PD	PD	PD	275
Toluene	300	125	90	85	50
Trichloroethane	D	PD	PD	PD	PD
Normal Saline (0.9% Sodium Chloride)	0	0	0	0	0
1N HCl (Hydrochloric Acid)	0	0	0	0	0
1N NaOH (Sodium Hydroxide)	0	0	0	0	0
PEG 300	0	0	0	0	0
PolyPropylene Glycol	0	0	0	0	0
Polysorbate - 80	0	0	0	0	0

 PD = Partially Dissolved
 D = Completely Dissolved

Solvent Absorption

Aromatic Carbothane™ TPU

24 hours @ 23°C, ASTM-D 570

Solvent, TPU	AC-4075A	AC-4085A	AC-4095A	AC-4055D	AC-4075A-B20	AC-4085A-B20	AC-4095A-B20	AC-4055D-B20
% wt Increase								
Acetonitrile	55	35	20	16	45	25	17	14
Acetone	200	125	55	40	175	80	50	40
Caster Oil	0	0	0	0	0	0	0	0
Chloroform	PD	525	350	275	PD	725	325	250
Cyclohexane	1	1	0	0	1	0	0	0
Cyclohexanone	PD	130	85	50	PD	75	80	55
Cyclopentanone	PD	PD	250	150	PD	PD	PD	PD
Diethylether	17	12	7	4	13	8	5	4
Dimethylacetamide	D	D	D	D	D	D	D	D
Dimethylformamide	D	D	D	D	D	D	D	D
Dimethylsulfoxide	75	125	PD	PD	65	PD	PD	PD
Dioxane	PD	PD	150	100	PD	PD	150	100
Ethanol	3	2	2	1	3	2	1	1
Ethylacetate	160	75	40	25	150	50	30	20
Hexane	1	1	0	0	1	0	0	0
Isopropyl alcohol	2	1	1	0	1	1	1	0
Methanol	5	4	3	2	4	3	2	2
Methylene Chloride	800	650	250	175	825	450	250	200
Methyl Ethyl Ketone	300	175	75	55	PD	125	45	45
Tetrahydrofuran	D	D	PD	375	D	D	PD	PD
Toluene	100	60	30	16	95	40	20	15
Trichloroethane	PD	PD	175	125	650	325	150	125
Normal Saline (0.9% Sodium Chloride)	8	0	0	0	0	0	0	0
1N HCl (Hydrochloric Acid)	0	0	0	0	0	0	0	0
1N NaOH (Sodium Hydroxide)	0	0	0	0	0	0	0	0
PEG 300	0	0	0	0	0	0	0	0
PolyPropylene Glycol	0	0	0	0	0	0	0	0
Polysorbate - 80	0	0	0	0	0	0	0	0

PD = Partially Dissolved
D = Completely Dissolved

Solvent Absorption

Isoplast® TPU

24 hours @ 23°C, ASTM-D 570

Solvent, TPU	2510	2530 R1	2531
% wt Increase			
Acetonitrile	1	1	1
Acetone	16	10	25
Caster Oil	0	0	0
Chloroform	35	17	60
Cyclohexane	125	0	0
Cyclohexanone	20	20	PD
Cyclopentanone	45	30	PD
Diethylether	1	0	0
Dimethylacetamide	D	D	D
Dimethylformamide	D	PD	D
Dimethylsulfoxide	PD	PD	PD
Dioxane	30	20	PD
Ethanol	1	0	1
Ethylacetate	3	4	10
Hexane	0	0	0
Isopropyl alcohol	0	0	0
Methanol	2	1	2
Methylene Chloride	50	25	60
Methyl Ethyl Ketone	25	13	40
Tetrahydrofuran	125	95	PD
Toluene	0	0	0
Trichloroethane	16	8	40
Normal Saline (0.9% Sodium Chloride)	0	0	0
1N HCl (Hydrochloric Acid)	0	0	0
1N NaOH (Sodium Hydroxide)	0	0	0
PEG 300	1	1	5
PolyPropylene Glycol	0	0	0
Polysorbate - 80	0	0	0

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Solvent Absorption Pellethane® TPU

24 hours @ 23°C, ASTM-D 570

Solvent, TPU	2363-80AE	2363-90AE	2363-55DE
% wt Increase			
Acetonitrile	13	10	7
Acetone	70	50	35
Caster Oil	0	0	0
Chloroform	625	375	250
Cyclohexane	4	2	1
Cyclohexanone	PD	125	95
Cyclopentanone	PD	PD	PD
Diethylether	25	16	9
Dimethylacetamide	D	D	PD
Dimethylformamide	D	D	D
Dimethylsulfoxide	PD	PD	PD
Dioxane	PD	250	125
Ethanol	12	7	5
Ethylacetate	65	35	25
Hexane	3	1	0
Isopropyl alcohol	7	4	3
Methanol	16	12	9
Methylene Chloride	450	250	175
Methyl Ethyl Ketone	70	90	60
Tetrahydrofuran	D	D	D
Toluene	55	30	16
Trichloroethane	375	200	125
Normal Saline (0.9% Sodium Chloride)	1	1	1
1N HCl (Hydrochloric Acid)	1	1	0
1N NaOH (Sodium Hydroxide)	1	0	0
PEG 300	1	1	1
PolyPropylene Glycol	0	0	0
Polysorbate - 80	1	0	0

PD = Partially Dissolved
D = Completely Dissolved

Solvent Absorption

Tecoflex™ MG TPU

24 hours @ 23°C, ASTM-D 570

Solvent, TPU	MG-8020	MG-8812
% wt Increase		
Acetonitrile	5	2
Acetone	30	17
Caster Oil	0	0
Chloroform	D	D
Cyclohexane	0	0
Cyclohexanone	60	55
Cyclopentanone	125	65
Diethylether	10	2
Dimethylacetamide	PD	PD
Dimethylformamide	PD	PD
Dimethylsulfoxide	75	75
Dioxane	150	100
Ethanol	20	14
Ethylacetate	35	19
Hexane	0	0
Isopropyl alcohol	11	7
Methanol	30	20
Methylene Chloride	-	375
Methyl Ethyl Ketone	50	35
Tetrahydrofuran	PD	PD
Toluene	50	20
Trichloroethane	PD	PD
Normal Saline (0.9% Sodium Chloride)	0	0
1N HCl (Hydrochloric Acid)	0	0
1N NaOH (Sodium Hydroxide)	0	0
PEG 300	0	0
PolyPropylene Glycol	0	0
Polysorbate - 80	0	0

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D = Completely Dissolved

Solvent Absorption Tecoflex™ TPU

24 hours @ 23°C, ASTM-D 570

Solvent, TPU	EG-80A	EG-85A	EG-93A	EG-100A	EG-60D	EG-65D	EG-68D	EG-72D
% wt Increase								
Acetonitrile	25	19	12	11	9	8	7	6
Acetone	95	65	45	45	40	40	35	30
Caster Oil	3	2	0	0	0	0	0	0
Chloroform	D	D	D	D	PD	D	D	PD
Cyclohexane	35	20	5	3	2	1	1	1
Cyclohexanone	230	150	80	80	60	60	60	45
Cyclopentanone	425	250	175	175	100	135	125	85
Diethylether	80	55	30	30	20	25	25	15
Dimethylacetamide	PD	PD	PD	PD	PD	PD	PD	PD
Dimethylformamide	D	PD	PD	PD	PD	PD	PD	PD
Dimethylsulfoxide	14	16	20	35	25	35	35	45
Dioxane	350	250	175	225	125	175	150	95
Ethanol	50	35	25	30	20	25	20	17
Ethylacetate	175	100	55	65	40	55	45	35
Hexane	17	13	3	2	2	1	1	0
Isopropyl alcohol	35	25	13	17	10	14	12	9
Methanol	55	40	30	40	30	35	30	20
Methylene Chloride	D	1050	950	1300	975	850	525	500
Methyl Ethyl Ketone	275	125	80	75	60	65	60	50
Tetrahydrofuran	D	PD	PD	PD	PD	PD	PD	PD
Toluene	350	175	90	100	65	80	70	55
Trichloroethane	PD	PD	PD	PD	PD	PD	PD	PD
Normal Saline (0.9% Sodium Chloride)	1	1	1	1	1	1	1	0
1N HCl (Hydrochloric Acid)	1	1	1	1	0	1	1	0
1N NaOH (Sodium Hydroxide)	1	1	1	1	0	1	1	0
PEG 300	1	0	0	0	0	0	0	0
PolyPropylene Glycol	0	0	0	0	0	0	0	0
Polysorbate - 80	1	0	0	0	0	0	0	0

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Solvent Absorption Tecophilic™ TPU

24 hours @ 23°C, ASTM-D 570

Solvent, TPU	HP-93A-100	HP-60D-20	HP-60D-60
% wt Increase			
Acetonitrile	100	35	60
Acetone	100	55	60
Caster Oil	0	0	0
Chloroform	D	D	D
Cyclohexane	1	1	0
Cyclohexanone	PD	60	45
Cyclopentanone	PD	175	125
Diethylether	14	20	7
Dimethylacetamide	D	PD	PD
Dimethylformamide	PD	PD	PD
Dimethylsulfoxide	350	85	PD
Dioxane	PD	250	225
Ethanol	60	35	30
Ethylacetate	100	70	55
Hexane	1	1	0
Isopropyl alcohol	25	17	13
Methanol	150	60	75
Methylene Chloride	D	1500	1350
Methyl Ethyl Ketone	125	80	70
Tetrahydrofuran	PD	575	400
Toluene	80	80	45
Trichloroethane	PD	PD	PD
Normal Saline (0.9% Sodium Chloride)	80	9	40
1N HCl (Hydrochloric Acid)	95	11	45
1N NaOH (Sodium Hydroxide)	60	6	30
PEG 300	8	1	2
PolyPropylene Glycol	2	0	0
Polysorbate - 80	1	0	0

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D = Completely Dissolved

Solvent Absorption

Tecoplast™ TPU

24 hours @ 23°C, ASTM-D 570

Solvent, TPU	OP 770 -000
% wt Increase	
Acetonitrile	4
Acetone	40
Caster Oil	0
Chloroform	350
Cyclohexane	0
Cyclohexanone	D
Cyclopentanone	D
Diethylether	14
Dimethylacetamide	D
Dimethylformamide	D
Dimethylsulfoxide	PD
Dioxane	PD
Ethanol	5
Ethylacetate	45
Hexane	0
Isopropyl alcohol	2
Methanol	7
Methylene Chloride	200
Methyl Ethyl Ketone	75
Tetrahydrofuran	D
Toluene	25
Trichloroethane	175
Normal Saline (0.9% Sodium Chloride)	0
1N HCl (Hydrochloric Acid)	0
1N NaOH (Sodium Hydroxide)	0
PEG 300	11
PolyPropylene Glycol	0
Polysorbate - 80	3

PD = Partially Dissolved
D = Completely Dissolved

Solvent Absorption Tecothane™ Soft TPU

24 hours @ 23°C, ASTM-D 570

Solvent, TPU	AR-75A	AR-85A	AR-95A
% wt Increase			
Acetonitrile	4	3	3
Acetone	30	25	25
Caster Oil	0	0	0
Chloroform	825	375	525
Cyclohexane	40	25	13
Cyclohexanone	200	175	175
Cyclopentanone	325	225	275
Diethylether	95	60	45
Dimethylacetamide	PD	PD	D
Dimethylformamide	75	100	200
Dimethylsulfoxide	16	30	40
Dioxane	200	150	150
Ethanol	3	3	3
Ethylacetate	75	55	45
Hexane	25	20	10
Isopropyl alcohol	3	3	2
Methanol	2	2	2
Methylene Chloride	525	470	325
Methyl Ethyl Ketone	125	45	200
Tetrahydrofuran	600	575	575
Toluene	200	125	80
Trichloroethane	450	275	200
Normal Saline (0.9% Sodium Chloride)	0	0	0
1N HCl (Hydrochloric Acid)	0	0	0
1N NaOH (Sodium Hydroxide)	2	0	0
PEG 300	0	0	0
PolyPropylene Glycol	0	0	0
Polysorbate - 80	0	0	0

PD = Partially Dissolved
D = Completely Dissolved

Solvent Absorption Tecothane™ TPU

24 hours @ 23°C, ASTM-D 570

Solvent, TPU	TT-1074A	TT-1085A	TT-1095A	TT-1055D	TT-1065D	TT-1069D	TT-1072D	TT-1075D-M
% wt Increase								
Acetonitrile	18	14	10	7	4	5	4	3
Acetone	125	85	45	30	30	20	25	30
Caster Oil	0	0	0	0	0	0	0	0
Chloroform	2000	725	325	225	200	150	175	150
Cyclohexane	6	4	2	1	0	0	0	0
Cyclohexanone	PD	PD	125	60	50	45	55	75
Cyclopentanone	PD	PD	PD	225	175	125	175	150
Diethylether	40	30	16	10	5	4	4	3
Dimethylacetamide	D	D	D	D	D	D	D	D
Dimethylformamide	D	D	D	D	D	D	D	D
Dimethylsulfoxide	60	80	PD	PD	PD	PD	PD	PD
Dioxane	PD	PD	175	85	95	60	85	100
Ethanol	17	12	7	5	4	3	4	3
Ethylacetate	125	70	35	20	19	12	18	16
Hexane	3	3	1	1	0	0	0	0
Isopropyl alcohol	10	7	4	3	2	1	1	1
Methanol	20	17	12	9	7	6	7	6
Methylene Chloride	1150	625	225	150	125	100	125	100
Methyl Ethyl Ketone	425	275	70	45	65	30	45	50
Tetrahydrofuran	D	D	D	PD	PD	PD	PD	PD
Toluene	95	75	50	15	9	7	7	4
Trichloroethane	775	500	175	100	125	70	100	85
Normal Saline (0.9% Sodium Chloride)	1	1	1	1	0	0	0	0
1N HCl (Hydrochloric Acid)	1	1	1	1	0	0	0	0
1N NaOH (Sodium Hydroxide)	1	1	1	1	1	0	0	0
PEG 300	2	1	1	1	1	1	1	2
PolyPropylene Glycol	0	0	0	0	0	0	0	0
Polysorbate - 80	1	1	0	0	0	0	0	0

PD = Partially Dissolved
D = Completely Dissolved

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