ChemResist ROTATIONAL SINTER LINING

Benchmark for Surface Protection

Gutbrod

ChemResist

ROTATIONAL-LINING

RESISTANCE LIST AND TECHNICAL DATA

COATING TECHNOLOGY TO MEET THE HIGHEST EXPECTATIONS

Rudolf Gutbrod GmbH in Swabian Dettingen/ Erms sets new standards in innovative coating technology. The company is leading in Europe as a processor of fluorinated polymers.

The enterprise was founded in 1964 and is a pioneer in Germany in surface coating technology with fluoropolymers. And as a licensee of well-known raw material manufacturers to some of Europe's top addresses, as far as functional coatings with non-stick effect, low friction, chemical protection and corrosion protection are concerned. State-of-the-art technology is ensured through continuous development work.

Raw material procurement is undertaken on a worldwide basis. International and permanent exchange of ideas will ensure that the highest possible quality will be maintained in solving the different requirements of our customers also in the future.

PERFECT SOLUTION FOR SINTER LINING PROJECTS

ChemResist puts a new emphasis in this case using a process and computer-controlled lining technology according to the rotational sinter lining process. This procedure creates a seamless lining with virtually uniform coating thickness.

High-quality partially and fully fluorinated materials, such as ETFE und PFA, and the high performance polymers PE, PP and PA, are used by ChemResist. ETFE and PE are also available as electrically conducting versions. ChemResist can also supply with FDA-conform certification upon request. This also applies to electrically conductive specifications.

Partly and fully fluorinated polymers offer universal and permanent resistance to acids, alkalis, solvents and chlorides. ChemResist possesses an extremely smooth and anti-adhesive surface and thus prevents bacterial adherence or growth. In the manufacture of highly pure products (chip industry, high purity grade chemicals) ChemResist prevents impaired quality from foreign substances or dissolved metallic ions.

FLEXIBLE AND ECONOMICAL

If special parts are to be lined, ChemResist possesses distinct advantages both from an economic as well as a qualitative point of view. The process can be adapted flexibly to the circumstances or requirements (preparation of tooling is not required). Even rigid construction specifications can be solved economically with ChemResist.

Mechanical preliminary work, as well as the use of adhesives, can be avoided. Chemical resistance and high temperature resilience remain unaffected. The permanent and homogeneous lamination to the substrate means new and interesting perspectives in use under vacuum.

More detailed information are available in our ChemResist brochure and on the internet at **www.gutbrod-ptfe.de/produkte/chemresist**.

Table 1
Chemical compatibility – taking DuPont Teflon® ETFE as an example
(based on tests of representative materials and engineering judgment)

	Chemical	Maximum Use Temperature °F	°C
A	Acetaldehyde	200	95
	Acetamide	250	120
	Acetic Acid (50%)	250	120
	Acetic Acid (Glacial)	230	110
	Acetic Anhydride	300	150
	Acetone	150	65
	Acetone (50% H_2O)	150	65
	Acetonitrile	150	65
	Acetophenone	300	150
	Acetylchloride	150	65
	Acetylene	250	120
	Acetylene Tetrabromide	300	150
	Acetylene Tetrachloride	300	150
	Acrylonitrile	150	65
	Adipic Acid	275	135
	Air	300	150
	Allyl Alcohol	212	100
	Allyl Chloride	212	100
	Aluminum Ammonium Sulfate	300	150
	Aluminum Chloride	300	150
	Aluminum Fluoride	300	150
	Aluminum Hydroxide	300	150
	Aluminum Nitrate	300	150
	Aluminum Oxychloride	300	150
	Aluminum Potassium Sulfate	300	150
	Amino Acids (H_2O)	212	100
	Ammonia (Anhydrous)	300	150
	Ammonia (Aqueous 30%)	230	110
	Ammonium Bifluoride	300	150
	Ammonium Bromide (50%)	275	135
	Ammonium Carbonate	300	150
	Ammonium Chloride	300	150
	Ammonium Dichromate	275	135
	Ammonium Fluoride	300	150
	Ammonium Hydroxide	300	150
	Ammonium Nitrate (Conc.)	230	110
	Ammonium Perchlorate	275	135
	Ammonium Persulfate	150	65
	Ammonium Phosphate	300	150
	Ammonium Sulfate	300	150
	Ammonium Sulfide	300	150
	Ammonium Thiocyanate	300	150
	Amyl Acetate	250	120
	Amyl Alcohol	300	150
	Amyl Chloride	300	150
	Aniline	230	110
	Aniline Hydrochloride (10%)	150	65
	Anthraquinone	275	135
	Anthraquinone-Sulfonic Acid	275	135
	Antimony Trichloride	212	100
	Aqua Regia	212	100
	Arsenic Acid	300	150
B	Barium Carbonate	300	150
	Barium Chloride	300	150
	Barium Hydroxide	300	150
	Barium Sulfate	300	150
	Barium Sulfide	300	150
	Battery Acid	250	120
	Benzaldehyde	212	100
	Benzene	212	100
	Benzene Sulfonic Acid	212	100
	Benzoic Acid	275	135
	Benzoyl Chloride	150	65
	Benzyl Alcohol	300	150
	Benzyl Chloride	300	150
	Bismuth Carbonate	300	150
	Black Liquor	300	150
	Bleach (12.5% Cl_2)	212	100
	Borax	300	150
	Boric Acid	300	150
	Brine	300	150
	Bromic Acid	250	120
	Bromine (Dry)	150	65
	Bromine Water (10%)	230	110
	mono-Bromobenzene	212	100
	Bromoform	212	100
	m-Bromotoluene	212	100
	Butadiene	250	120
	Butane	300	150
	Butanediol	275	135
	Butyl Acetate	230	110
	Butyl Acrylate	230	110
	n-Butyl Alcohol	300	150
	sec-Butyl Alcohol	300	150
	tert-Butyl Alcohol	300	150
	n-Butylamine	120	50
	sec-Butylamine	120	50
	tert-Butylamine	120	50
	di-n-Butyl Amine	230	110
	tri-n-Butyl Amine	230	110
	Butylene	300	150
	Butyl Bromide	300	150
	Butyl Chloride	300	150
	n-Butyl Mercaptan	300	150
	Butyl Phenol	230	110
	Butyl Phthalate	150	65
	Butyraldehyde	212	100
	Butyric Acid	250	120
C	Calcium Bisulfate	300	150
	Calcium Bisulfide	300	150
	Calcium Carbonate	300	150
	Calcium Chlorate	300	150
	Calcium Chloride	300	150
	Calcium Hydroxide	300	150
	Calcium Hypochlorite	300	150
	Calcium Nitrate	300	150
	Calcium Oxide	275	135
	Calcium Sulfate	300	150
	Calcium Sulfide	250	120
	Caprylic Acid	212	100

Source: www.dupont.com. Rudolf Gutbrod GmbH has been a DuPont licensee in Germany since 1967 (continued)

Table 1 (continued)
Chemical compatibility – taking DuPont Teflon® ETFE as an example (based on tests of representative materials and engineering judgment)

	Chemical	Maximum Use Temperature °F	°C
	Carbon Dioxide (Dry)	300	150
	Carbon Dioxide (Wet)	300	150
	Carbon Disulfide	150	65
	Carbon Monoxide	300	150
	Carbon Tetrachloride	150	65
	Carbonic Acid	300	150
	Castor Oil	300	150
	Caustic Potash (10 and 50%)	212	100
	Caustic Soda (10 and 50%)	212	100
	Cellosolve®	300	150
	Chloral Hydrate	212	100
	Chlorinated Brine	250	120
	Chlorinated Phenol	212	100
	Chlorine (Dry)	212	100
	Chlorine (Wet)	250	120
	Chlorine Dioxide	250	120
	Chloroacetic Acid (50% H_2O)	230	110
	Chlorobenzene	212	100
	Chlorobenzyl Chloride	150	65
	Chloroform	212	100
	Chlorohydrin (Liquid)	150	65
	Chlorosulphonic Acid	75	25
	Chromic Acid (50%)	150	65
	Chromic Chloride	212	100
	Chromyl Chloride	212	100
	Clorox Bleach Solution (5-1/2% Cl_2)	212	100
	Coal Gas	212	100
	Copper Chloride	300	150
	Copper Cyanide	300	150
	Copper Fluoride	300	150
	Copper Nitrate	300	150
	Copper Sulfate	300	150
	Cresol	275	135
	Cresylic Acid	275	135
	Crotonaldehyde	212	100
	Crude Oil	300	150
	Cyclohexane	300	150
	Cyclohexanol	250	120
	Cyclohexanone	300	150
D	DDT	212	100
	Decalin	250	120
	Decane	300	150
	Dextrin	300	150
	Diacetone Alcohol	212	100
	1,2-Dibromopropane	200	95
	Dibutyl Phthalate	150	65
	Dichloroacetic Acid	150	65
	o-Dichlorobenzene	150	65
	Dichloroethylene	150	65
	Dichloropropionic Acid	150	65
	Diesel Fuels	300	150
	Diethyl Benzene	275	135
	Diethyl Cellosolve	300	150
	Diethyl Ether	212	100
	Diethylamine	230	110
	Diethylene Triamine	212	100
	Diglycolic Acid	212	100
	Diisobutyl Ketone	230	110
	Diisobutylene	275	135
	Dimethyl Formamide	250	120
	Dimethyl Phthalate	212	100
	Dimethyl Sulfate	150	65
	Dimethyl Sulfoxide	212	100
	Dimethylamine	120	50
	Dimethylaniline	275	135
	Dioctyl Phthalate	150	65
	p-Dioxane	150	65
	Diphenyl Ether	175	80
	Divinyl Benzene	175	80
E	Epichlorhydrin	150	65
	Ethyl Acetate	150	65
	Ethyl Acrylate	212	100
	Ethyl Alcohol	300	150
	Ethyl Chloride	300	150
	Ethyl Chloroacetate	212	100
	Ethyl Cyanoacetate	212	100
	Ethylacetoacetate	150	65
	Ethylamine	100	40
	Ethylene Bromide	300	150
	Ethylene Chloride	300	150
	Ethylene Chlorohydrin	150	65
	Ethylene Diamine	120	50
	Ethylene Glycol	300	150
	Ethylene Oxide	230	110
F	Fatty Acids	300	150
	Ferric Chloride (50% in H_2O)	300	150
	Ferric Hydroxide	300	150
	Ferric Nitrate	300	150
	Ferric Sulfate	300	150
	Ferrous Chloride	300	150
	Ferrous Hydroxide	300	150
	Ferrous Nitrate	300	150
	Ferrous Sulfate	300	150
	Fluorine (Gaseous)	100	40
	Fluoroboric Acid	275	135
	Fluosilicic Acid	275	135
	Formaldehyde (37% in H_2O)	230	110
	Formic Acid	275	135
	FREON® 11	230	110
	FREON® 12	230	110
	FREON® 22	230	110
	Fuel Oil	300	150
	Fumaric Acid	200	95
	Furane	150	65
	Furfural	212	100
G	Gallic Acid	212	100
	Gas—Manufactured	300	150
	Gas—Natural	300	150
	Gasoline—Leaded	300	150
	Gasoline—Sour	300	150
	Gasoline—Unleaded	300	150

Source: www.dupont.com. Rudolf Gutbrod GmbH has been a DuPont licensee in Germany since 1967

Table 1 (continued)
Chemical compatibility – taking DuPont Teflon® ETFE as an example (based on tests of representative materials and engineering judgment)

Chemical	Maximum Use Temperature °F	°C
Glycerol	300	150
Glycol	275	135
Glycolic Acid	250	120
H Heptane	300	150
Hexane	300	150
Hydrazine	100	40
Hydrazine Dihydrochloride	125	50
Hydriodic Acid	300	150
Hydrobromic Acid (50%)	300	150
Hydrochloric Acid (20%)	300	150
Hydrochloric Acid (Conc.)	300	150
Hydrochloric Acid (Gas)	300	150
Hydrocyanic Acid	300	150
Hydrofluoric Acid (35%)	275	135
Hydrofluoric Acid (70%)	250	120
Hydrofluoric Acid (100%)	230	110
Hydrofluorosilicic Acid	300	150
Hydrogen	300	150
Hydrogen Cyanide	300	150
Hydrogen Peroxide (30%)	250	120
Hydrogen Peroxide (90%)	150	65
Hydrogen Phosphide	150	65
Hydrogen Sulfide (Dry)	300	150
Hydrogen Sulfide (Wet)	300	150
Hydroquinone	250	120
Hypochlorous Acid	300	150
I Inert Gases	300	150
Iodine (Dry)	230	110
Iodine (Wet)	230	110
Iodoform	230	110
Isobutyl Alcohol	275	135
Isopropylamine	120	50
J Jet Fuel—JP4	230	110
Jet Fuel—JP5	230	110
L Lactic Acid	250	120
Lard Oil	300	150
Lauric Acid	250	120
Lauryl Chloride	275	135
Lauryl Sulfate	250	120
Lead Acetate	300	150
Linoleic Acid	275	135
Linseed Oil	300	150
Lithium Bromide (Saturated)	250	120
Lithium Hydroxide	300	150
Lubricating Oil	300	150
M Magnesium Carbonate	300	150
Magnesium Chloride	300	150
Magnesium Hydroxide	300	150
Magnesium Nitrate	300	150
Magnesium Sulfate	300	150
Maleic Acid	275	135
Maleic Anhydride	200	95
Malic Acid	275	135
Mercuric Chloride	275	135
Mercuric Cyanide	275	135
Mercuric Nitrate	275	135
Mercury	275	135
Methacrylic Acid	200	95
Methane	250	120
Methane Sulfonic Acid (50%)	230	110
Methyl Alcohol	300	150
n-Methylaniline	250	120
Methyl Benzoate	250	120
Methyl Bromide	300	150
Methyl Cellosolve®	300	150
Methyl Chloride	200	95
Methyl Chloroform	150	65
Methyl Chloromethyl Ether	175	80
Methyl Cyanoacetate	175	80
Methyl Ethyl Ketone	230	110
Methyl Isobutyl Ketone	230	110
Methyl Methacrylate	175	80
Methyl Salicylate	200	95
Methyl Sulfuric Acid	212	100
Methyl Trichlorosilane	200	95
Methylene Bromide	212	100
Methylene Chloride	212	100
Methylene Iodide	212	100
Mineral Oil	300	150
Monochlorobenzene	230	110
Monoethanolamine	150	65
Morpholine	150	65
N Naphtha	300	150
Naphthalene	300	150
Nickel Chloride	300	150
Nickel Nitrate	300	150
Nickel Sulfate	300	150
Nicotine	212	100
Nicotinic Acid	250	120
Nitric Acid (50%)	221	105
Nitric Acid (Conc. 70%)	248	120
Nitric Acid—Sulfuric Acid (50/50)	212	100
Nitrobenzene	300	150
Nitrogen Dioxide	212	100
Nitrogen Gas	300	150
Nitromethane	212	100
Nitrous Acid	212	100
O Octane	300	150
Octene	300	150
Oleic Acid	275	135
Oleum	120	50
Oxalic Acid	230	110
Oxygen	300	150
Ozone (<1% in Air)	212	100
P Palmitic Acid	275	135
Perchlorethylene	275	135
Perchloric Acid (10%)	230	110
Perchloric Acid (72%)	150	65
Petrolatum	300	150

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(continued)

Table 1 (continued)
Chemical compatibility – taking DuPont Teflon® ETFE as an example (based on tests of representative materials and engineering judgment)

	Chemical	Maximum Use Temperature °F	°C
	Petroleum	300	150
	Petroleum Ether	212	100
	Phenol (10%)	230	110
	Phenol (100%)	212	100
	Phenolsulfonic Acid	212	100
	Phenylhydrazine	212	100
	Phenylhydrazine Hydrochloride	212	100
	o-Phenylphenol	212	100
	Phosgene	212	100
	Phosphoric Acid (30%)	300	150
	Phosphoric Acid (85%)	275	135
	Phosphorus Oxychloride	221	100
	Phosphorus Pentachloride	212	100
	Phosphorus Pentoxide	230	110
	Phosphorus Trichloride	250	120
	Phthalic Acid	212	100
	Phthalic Anhydride	212	100
	Picric Acid	125	50
	Polyvinyl Acetate	300	150
	Polyvinyl Alcohol	300	150
	Potassium Aluminum Chloride	300	150
	Potassium Aluminum Sulfate (50%)	300	150
	Potassium Bicarbonate	300	150
	Potassium Borate	300	150
	Potassium Bromate	300	150
	Potassium Bromide	300	150
	Potassium Carbonate	300	150
	Potassium Chlorate	300	150
	Potassium Chloride	300	150
	Potassium Chromate	300	150
	Potassium Cyanide	300	150
	Potassium Dichromate	300	150
	Potassium Ferrocyanide	300	150
	Potassium Fluoride	300	150
	Potassium Hydroxide (50%)	212	100
	Potassium Hypochlorite	275	135
	Potassium Nitrate	300	150
	Potassium Perborate	275	135
	Potassium Perchlorate	212	100
	Potassium Permanganate	300	150
	Potassium Persulfate	150	65
	Potassium Sulfate	300	150
	Potassium Sulfide	300	150
	Propane	275	135
	Propionic Acid	212	100
	Propyl Alcohol	300	150
	Propylene Dibromide	212	100
	Propylene Dichloride	212	100
	Propylene Glycol Methyl Ether	212	100
	Propylene Oxide	150	65
	Pyridine	150	65
	Pyrogallol	150	65
S	Salicylaldehyde	212	100
	Salicylic Acid	250	120
	Salt Brine	300	150
	Sea Water	300	150
	Silicon Tetrachloride	250	120
	Silver Chloride	300	150
	Silver Cyanide	300	150
	Silver Nitrate	300	150
	Sodium Acetate	300	150
	Sodium Benzene-Sulfonate	300	150
	Sodium Benzoate	300	150
	Sodium Bicarbonate	300	150
	Sodium Bisulfate	300	150
	Sodium Bisulfite	300	150
	Sodium Borate	212	100
	Sodium Bromide	300	150
	Sodium Carbonate	300	150
	Sodium Chlorate	300	150
	Sodium Chloride	300	150
	Sodium Chromate	300	150
	Sodium Cyanide	300	150
	Sodium Dichromate (Alkaline)	212	100
	Sodium Ferricyanide	300	150
	Sodium Ferrocyanide	300	150
	Sodium Fluoride	300	150
	Sodium Glutamate	275	135
	Sodium Hydroxide (10%)	230	110
	Sodium Hydroxide (50%)	230	110
	Sodium Hypochlorite	300	150
	Sodium Hyposulfite	300	150
	Sodium Iodide	300	150
	Sodium Lignosulfonate	300	150
	Sodium Metasilicate	300	150
	Sodium Nitrate	300	150
	Sodium Nitrite	300	150
	Sodium Perborate	212	100
	Sodium Perchlorate	150	65
	Sodium Peroxide	300	150
	Sodium Persulfate	175	80
	Sodium Phosphate	300	150
	Sodium Silicate	300	150
	Sodium Silicofluoride	300	150
	Sodium Sulfate	300	150
	Sodium Sulfide	300	150
	Sodium Sulfite	300	150
	Sodium Thiosulfate	300	150
	Sorbic Acid	275	135
	Sour Crude Oil	300	150
	Stannic Chloride	300	150
	Stannous Chloride	300	150
	Stannous Fluoride	250	120
	Stearic Acid	300	150
	Stoddard's Solvent	275	135
	Styrene Monomer	212	100
	Succinic Acid	275	135
	Sulfamic Acid	212	100
	Sulfur (Molten)	250	120
	Sulfur Dioxide	230	110
	Sulfur Trioxide (Liquid)	75	25
	Sulfuric Acid (60%)	300	150

Source: www.dupont.com. Rudolf Gutbrod GmbH has been a DuPont licensee in Germany since 1967

Table 1 (continued)
Chemical compatibility – taking DuPont Teflon® ETFE as an example (based on tests of representative materials and engineering judgment)

Chemical	Maximum Use Temperature °F	°C
Sulfuric Acid (Conc.)	300	150
Sulfuric Acid (Fuming—Oleum)	120	50
Sulfurous Acid	230	110
T Tall Oil	300	150
Tannic Acid	275	135
Tartaric Acid	275	135
2,3,4,6-Tetrachlorophenol	212	100
Tetraethyl Lead	300	150
Tetrahydrofuran	212	100
Tetramethyl Ammonium Hydroxide (50%)	212	100
Thionyl Chloride	212	100
Tin Tetrachloride	230	110
Titanium Dioxide	300	150
Titanium Tetrachloride	212	100
Toluene	250	120
Tributyl Phosphate	150	65
Trichloracetic Acid	212	100
Trichloroethylene	275	135
Trichloromethane	212	100
2,4,5-Trichlorophenol	212	100
Triethylamine	230	110
Trisodium Phosphate	275	135
Turpentine	275	135
U UDMH-Hydrazine (50/50)	120	50
Urea (50% H_2O)	275	135
V Varsol	275	135
Vinyl Acetate	275	135
Vinyl Chloride (Monomer)	150	65
W Water	300	150
Water Sewage	275	135
Wax	300	150
X Xylene	250	120
Z Zinc Acetate	250	120
Zinc Chloride	300	150
Zinc Hydrosulfite (10%)	250	120
Zinc Nitrate	300	150
Zinc Sulfate	300	150
Zinc Sulfide	300	150
PLATING SOLUTIONS		
Brass	275	135
Cadmium	275	135
Chrome	275	135
Copper	275	135
Gold	275	135

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Representative Compatibility Data

The test results shown in **Table 2** represent the tensile strength, elongation and weight changes after exposures at indicated temperatures.

The test results confirm the chemical resistant properties of ETFE.

Table 2
Actual laboratory tests on chemical compatibility – taking DuPont Teflon® ETFE as an example - with representative chemicals

Chemical	Boiling Point °F	Boiling Point °C	Test Temperature °F	Test Temperature °C	Days	Retained Properties—% Tensile Strength	Retained Properties—% Elong.	Retained Properties—% Weight Gain
Acid/Anhydrides								
Acetic Acid (Glacial)	244	118	244	118	7	82	80	3.4
Acetic Anhydride	282	139	282	139	7	100	100	0
Trichloroacetic Acid	384	196	212	100	7	90	70	0
Aliphatic Hydrocarbons								
Mineral Oil	—	—	356	180	7	90	60	0
Naphtha	—	—	212	100	7	100	100	0.5
Aromatic Hydrocarbons								
Benzene	176	80	176	80	7	100	100	0
Toluene	230	110	230	110	7	—	—	—
Functional Aromatics								
O-Cresol	376	191	356	180	7	100	100	0
Amines								
Aniline	365	185	248	120	7	81	99	2.7
Aniline	365	185	248	120	30	93	82	—
Aniline	365	185	356	180	7	95	90	—
N,N-Dimethylaniline	374	190	248	120	7	82	97	—
N-Methylaniline	383	195	248	120	7	85	95	—
N-Methylaniline	383	195	248	120	30	100	100	—
n-Butylamine	172	78	172	78	7	71	73	4.4
Di-n-Butylamine	318	159	248	120	7	81	96	—
Di-n-Butylamine	318	159	248	120	30	100	100	—
Di-n-Butylamine	318	159	320	160	7	55	75	—
Tri-n-Butylamine	421	216	248	120	7	81	80	—
Tri-n-Butylamine	421	216	248	120	30	100	100	—
Pyridine	240	116	240	116	7	100	100	1.5
Chlorinated Solvents								
Carbon Tetrachloride	172	78	172	78	7	90	80	4.5
Chloroform	144	62	142	61	7	85	100	4.0
Dichloroethylene	170	77	90	32	7	95	100	2.8
FREON® 113	115	46	115	46	7	100	100	0.8
Methylene Chloride	104	40	104	40	7	85	85	0
Ethers								
Tetrahydrofuran	151	66	151	66	7	86	93	3.5
Aldehyde/Ketones								
Acetone	132	56	132	56	7	80	83	4.1
Acetophenone	394	201	356	180	7	80	80	1.5
Cyclohexanone	312	156	312	156	7	90	85	0
Methyl Ethyl Ketone	176	80	176	80	7	100	100	0

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Table 2 (continued)
Actual laboratory tests on chemical compatibility – taking DuPont Teflon® ETFE as an example - with representative chemicals

Chemical	Boiling Point °F	Boiling Point °C	Test Temperature °F	Test Temperature °C	Days	Retained Properties—% Tensile Strength	Retained Properties—% Elong.	Retained Properties—% Weight Gain
Esters								
n-Butyl Acetate	260	127	260	127	7	80	60	0
Ethyl Acetate	170	77	170	77	7	85	60	0
Polymer Solvents								
Dimethylformamide	309	154	194	90	7	100	100	1.5
Dimethylformamide	309	154	248	120	7	76	92	5.5
Dimethylsulfoxide	373	189	194	90	7	95	90	1.5
Other Organics								
Benzoyl Chloride	387	197	248	120	7	94	95	—
Benzoyl Chloride	387	197	248	120	30	100	100	—
Benzyl Alcohol	401	205	248	120	7	97	90	—
Decalin	374	190	248	120	7	89	95	—
Phthaloyl Chloride	529	276	248	120	30	100	100	—
Acids								
Aqua Regia	—	—	194	90	*	93	89	0.2
Chromic	257	125	257	125	7	66	25	—
Hydrobromic (Conc)	257	125	257	125	7	100	100	—
Hydrochloric (Conc)	223	106	73	23	7	100	90	0
Hydrochloric (Conc)	223	106	223	106	7	96	100	0.1
Hydrofluoric (Conc)	—	—	73	23	7	97	95	0.1
Nitric—25%	212	100	212	100	14	100	100	—
Nitric—50%	221	105	221	105	14	87	81	—
Nitric—70% (Conc)	248	120	73	23	105	100	100	0.5
Nitric—70% (Conc)	248	120	140	60	53	100	100	—
Nitric—70% (Conc)	248	120	248	120	2	72	91	—
Nitric—70% (Conc)	248	120	248	120	3	58	5	—
Nitric—70% (Conc)	248	120	248	120	7	0	0	—
Phosphoric (Conc)	—	—	212	100	7	—	—	—
Phosphoric (Conc)	—	—	248	120	7	94	93	0
Sulfuric (Conc)	—	—	212	100	7	100	100	0
Sulfuric (Conc)	—	—	248	120	7	98	95	0
Sulfuric (Conc)	—	—	302	150	*	98	90	0
Halogens								
Bromine (Anhy)	138	59	73	23	7	90	90	1.2
Bromine (Anhy)	138	59	135	57	7	99	100	—
Bromine (Anhy)	138	59	135	57	30	94	93	3.4
Chlorine (Anhy)	—	—	248	120	7	85	84	7
Bases								
Ammonium Hydroxide	—	—	150	66	7	97	97	0
Potassium Hydroxide (20%)	—	—	212	100	7	100	100	0
Sodium Hydroxide (50%)	—	—	248	120	7	94	80	0.2
Peroxides								
Hydrogen Peroxide (30%)	—	—	73	23	7	99	98	0

(continued)

*Exposed for 6 hours.

NOTES: Change in properties -15% is considered insignificant. Samples were 10–15 mil microtensile bars. TS/E and wt. gain determined within 24 hours after removal from exposure media.

Source: www.dupont.com. Rudolf Gutbrod GmbH has been a DuPont licensee in Germany since 1967

Table 2 (continued)
Actual laboratory tests on chemical compatibility – taking DuPont Teflon® ETFE as an example - with representative chemicals

Chemical	Boiling Point °F	Boiling Point °C	Test Temperature °F	Test Temperature °C	Days	Retained Properties—% Tensile Strength	Retained Properties—% Elong.	Retained Properties—% Weight Gain
Salt-Metal Etchants								
Ferric Chloride (25%)	220	104	212	100	7	95	95	0
Zinc Chloride (25%)	220	104	212	100	7	100	100	0
Other Inorganics								
Phosphoric Oxychloride	220	104	220	104	7	100	100	—
Phosphoric Trichloride	167	75	167	75	7	100	98	—
Silicon Tetrachloride	140	60	140	60	7	100	100	—
Sulfuryl Chloride	115	68	155	68	7	86	100	8
Water	212	100	212	100	7	100	100	0
Miscellaneous								
A-20 Stripper Solution	—	—	284	140	7	90	90	—
Aerosafe	—	—	300	149	7	92	93	3.9
Skydrol	—	—	300	149	7	100	95	3.0

*Exposed for 6 hours.

NOTES: Change in properties -15% is considered insignificant. Samples were 10–15 mil microtensile bars. TS/E and wt. gain determined within 24 hours after removal from exposure media.

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Benchmark for Surface Protection

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