



DuPont Powder Coatings

DuPont Polymer Powders Switzerland SA
Rue St-Joseph 25 / P.O. Box 140
CH-1630 Bulle 1

Product Information

Chemical resistance guide

Abcite®

A DuPont powder coating resin

Chemical resistance of Abcite® grades

Abcite® grades have outstanding resistance to both physical and chemical attack. They are also highly resistant to permeation by liquids.

Note : Tests were carried out on coating thicknesses of 500 µ.

Chemical environmental effects on *Abcite*® grades may be divided into three categories: oxidation, stress cracking and plasticization. Only oxidation is a chemical degradation, the other two involve the physical properties of the polymer.

Oxidizers

The chemical effects on *Abcite*® grades of even a strong oxidizer may be gradual and may not be measurable over the short term. However, they may be significant over the long term and should be evaluated if continuous exposure is expected. The following materials are examples of strong oxidizers which are unsuitable for long term exposure to Abcite:

Nitric acid, fuming
Sulfuric acid, fuming (oleum)
Aqua regia
Chlorine (wet gas)
Bromine (liquid)

Stress cracking agents

Certain surface-active materials, although they have no chemical effect on *Abcite*® grades, can accelerate cracking when under stress. This accelerated form of stress failure is called environmental stress cracking (ESC). ESC failure depends on the amount of stress in the *Abcite*® grades and, therefore, thermal history and design factors are very important. The following materials are examples of stress crack agents which are unsuitable for long term exposure to *Abcite*® grades:

Methyl Alcohol
Ethyl Alcohol
n-Propyl Alcohol
Isopropyl Alcohol
Ethylene Glycol



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Plasticizers

Certain types of non-aqueous chemicals are absorbed to varying degrees by *Abcite*® grades causing swelling, weight gain, softening and some loss of yield strength. These plasticizing materials cause no actual chemical degradation of the resin. Some organic solvents such as aliphatic hydrocarbons, chlorinated hydrocarbons, aromatics and heterocyclic compounds have a strong plasticizing action (10-20 % solubility in the polymer). However, most of these solvents are sufficiently volatile so that if they are removed from contact with *Abcite*® grades, the part will “dry out” and return to its original condition with no impairment of properties.

Testing is important

It cannot be expected that one chemical resistance data chart will include the effects of all chemicals on *Abcite*® grades. Furthermore, the suitability of *Abcite*® grades depend not only on the nature of the chemical environment but also on the expected service temperature and stress, the duration of exposure and whether it is intermitted or continuous. Because so many variables are involved, it must be recognized that standard laboratory tests can give only a general guide as to whether *Abcite*® grades may resist exposure to a specific environment. *Therefore, the feasibility of any chemical environment must be determined by extensive laboratory tests carried out under conditions which approximate as closely as possible those expected in service.*

1. Immerse a sample of chosen *Abcite*® in the chemical under study. The chosen *Abcite*® sample should be preweighed and immersed at the expected service temperature for a reasonable time (Note: many of the chemicals under study may be toxic, corrosive, flammable, and/or irritants. In addition, many of the chemicals under study should not be inhaled, ingested or in contact with the human skin. Therefore, accepted industrial standards should be used when involved with these chemicals).
2. At the end of the test period the *Abcite*® sample should be reweighed to determine if there is a weight gain or loss. In addition, any change in surface hardness should be noted.
3. Check for chemical degradation of the *Abcite*® sample by observing any surface crazing, cracking or discoloration.
4. Tensile properties should be checked by measuring ultimate tensile strength and elongation. Tensile properties will change with percent plasticization. If chemical attack has occurred, a remarkable decrease in ultimate tensile strength should be evident.
5. Environmental stress cracking characteristics of the chemical under study can be determined using ASTM test procedure D 1693 by substituting the chemical of interest for the test liquid specified in this procedure.



Guide to chemical resistance

The chemical resistance data presented in the following table originated in part from tests conducted at DuPont Laboratories and, in part, from reliable published sources. These data are valid for *Abcite*® X45, X0545, X60, X1060, X70 and X2070. It is some minor differences in their chemical resistances as they are all based on modified ethylen/methacrylic acid copolymer.

This table is intended only as a preliminary, general guide to the resistance for Abcite® grades to various chemicals. It should not be used by the industry as the basis for final decisions because the specific end use application, design and/or conditions of use may have added effects on performance in particular chemical environment. It is recommended that laboratory testing of the specific end use application be conducted under expected service conditions.

General guide to resistance of *Abcite*® grades to various chemicals

Resistance code	Caution code
R Resistant, no indication that Serviceability would be impaired	O Oxidizer
V Variable resistance, depending on conditions of use*	P Plasticizer
U Not resistant. Not recommended for service applications under any conditions	A Known stress crack agent**
	B Possible stress crack agent**

* The classification "variable resistance" is very broad. Depending on the nature of the chemical, its concentration, the service temperature and pressure, and the time of exposure, *Abcite*® grades can be either very resistant or very susceptible to attack. Therefore, where *Abcite*® grades are said to have variable resistance to a chemical, it is critical that extensive pretesting be conducted.

** A system using *Abcite*® grades in exposure to a chemical to which it is designated resistant, but which carries a stress identifier (A or B), may be serviceable over a useful lifetime providing the following precautions are observed:

- a. Stresses in the fabricated *Abcite*® grades must be minimized by design and processing.
- b. Conditions and limitations of the application should be carefully observed (avoidance of high temperature, etc.)

The technical data contained herein is a guide to the use of DuPont powder resins. The advice contained herein is based upon tests and information believed to be reliable, but users should not rely upon it absolutely for specific applications since performance properties will vary with processing conditions. It is given and accepted at user's risk and confirmation of its validity and suitability in particular cases should be obtained independently. The DuPont Company makes no guarantees of results and assumes no obligation or liability in connection with its advice. This publication is not to be taken as a license to operate under, or recommendation to infringe, any patents.

CAUTION : do not use in medical applications involving permanent implantation in the human body. For other medical applications, see « DuPont Medical Caution Statement , H-50102" »



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		21° C (70° F)	60° C (140° F)			21° C (70° F)	60° C (140° F)
B	Acetaldehyde(100%O)	V	U		Benzoic Acid	R	R
	Acetic Acid (10%)	R	R		Bismuth Carbonate	R	R
B	Acetic Acid (60%)	R	V		Black Liquor	R	R
	Acetic Anhydride	R	R		Bleach Lye (10%)	R	R
	Acetone	R	*		Borax	R	R
	Acrylic Emulsions	R	R		Boric Acid	R	R
	Adipic Acid	R	R		Brine	R	R
	Air	R	R		Bromic Acid	R	V
B, P	Allyl Chloride	U	U	O	Bromine, Liquid	U	U
	Aluminum Chloride	R	R	O	Bromine, Vapor (25%)	U	U
	Aluminum Fluoride	R	R	O	Bromine, Water	U	U
	Aluminum Hydroxide	R	R	P	Butadiene	V	*
	Aluminum Nitrate	R	R	P	Butane	R	*
	Aluminum Oxychloride	R	R	A	Butanediol	R	V
	Aluminum Sulfate	R	R		Butter	R	R
	Alums (all types)	R	R	P	n-Butyl Acetate(100%)	R	V
	Ammonia (100% dry gas)	R	R	A	n-Butyl Alcohol (100%)	V	U
	Ammonia, Liquid	R	R		Butyric Acid	U	U
	Ammonium Acetate	R	R		Cadmium Cyanide	R	R
	Ammonium Carbonate	R	R		Calcium Bisulfite	R	R
	Ammonium Chloride	R	R		Calcium Bisulfide	R	R
	Ammonium Fluoride	R	R		Calcium Carbonate	R	R
	Ammonium Hydroxide(10-28%)	R	R		Calcium Chlorate	R	R
	Ammonium Metaphosphate	R	R		Calcium Chloride	R	R
	Ammonium Nitrate	R	R		Calcium Hydroxide	R	R
	Ammonium Persulfate	R	R	B	Calcium Hydroxide (bleach solut.)	V	V
	Ammonium Phosphate, Ammoniacal and Neutral	R	R		Calcium Nitrate (50%)	R	R
	Ammonium Sulfide	R	R		Calcium Oxide	R	R
	Ammonium Sulfate	R	R		Calcium Sulfate	R	R
	Ammonium Thiocyanate	R	R	B, P	Camphor Oil	U	U
B, P	Amyl Acetate (100%)	U	U		Carbon (slurry)	R	R
A, P	Amyl Alcohol (100%)	V	V		Carbon Dioxide	R	R
P	Amyl Chloride(100%)	U	U		Carbon Disulfide	U	U
P	Aniline (100%O)	R	U		Carbon Monoxide	R	R
P	Aniline Hydrochloride	U	U	P	Carbon Tetrachloride	U	U
	Anthraquinone	R	R		Carbonic Acid	R	R
	Anthraquinone Sulfonic Acid	R	R		Castor Oil	R	R
	Antimony Trichloride	R	R		Caustic Potash	R	R
O	Aqua Regia	U	U		Caustic Soda	R	R
P	Aromatic Hydrocarbons	R	V	P	Cellosolve	R	U
	Arsenic Acid	R	R	P	Chloralhydrate	U	U
	Ascorbic Acid(10%)	R	R	O	Chlorine (100% dry gas)	U	U
	Barium Carbonate	R	R	O	Chlorine (wet gas)	U	U
	Barium Chloride	R	R	O	Chlorine Liquid	U	U
	Barium Hydroxide	R	R	B	ChlorineWater (2%)	R	V
	Barium Sulfate	R	R	P	Chlorobenzene	U	U
	Barium Sulfide	R	R	P	Chloroform	U	U
	Beer	R	R		Chlorosulfonic Acid(100%)	U	U
B	Beet Sugar Liquors	R	R		Chromic Acid (10%)	R	*
B	Benzaldehyde	V	U	O	Chromic Acid (30-50%)	R	*
P	Benzene	R	V		Cider	R	R
P	Benzene Sulfonic Acid	R	R		Citric Acid	R	R
				A	Coconut Oil Alcohols	R	V
					Coffee	R	R



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		21° C (70° F)	60° C (140° F)			21° C (70° C)	60° C (140° F)
	Cola Concentrates	R	R		Fluosilicic Acid (32%)	R	R
	Copper Carbonate	R	R	B	Formaldehyde	R	V
	Copper Chloride	R	R		Formic Acid	R	R
	Copper Cyanide	R	R		Fructose	R	R
	Copper Fluoride(2%)	R	R	B	Fruit Pulp	R	R
	Copper Nitrate	R	R	P	FurFural (100%)	U	U
	Copper Sulfate	R	R	B, P	Furfuryl Alcohol	U	U
	Corn Oil	R	R	B	Gallic Acid	R	R
	Corn Syrup	R	R	P	Gas, Natural, Dry and Wet	R	*
P	Cottonseed Oil	R	R	P	Gasoline	R	V
P	Cresol	U	U	P	Gasoline, High Octane	R	V
	Crude Oil	R	R	P	Genetron 11, 12 & 22	r	*
	Cupric Fluoride	R	R		Glucose	R	R
	Cugric Sulfate	R	R	B	Glycerine	R	R
	Cuprous Chloride	R	R	A	Glycol	V	U
B	Cyclohexanol	R	V	A	Glycolic Acid (30%)	R	R
P	Cyclohexanone	R	U		GrapeSugar (sat.aq.)	R	R
B	Detergents, Synthetic	R	R	P	n-Heptane	R	V
	Developers, Photographic	R	R		Hexachlorobenzene	R	R
	Dextrin	R	R	P	Hexane	R	V
	Dextrose	R	R	B	Hexanol, Tertiary	R	R
	Diazo Salts	R	R	*	Hydrobromic Acid (50%)	R	R
	Dibutylphthalate	R	V		Hydrochloric Acid	R	R
B, P	Dichlorobenzene (o & p)	U	U		Hydrocyanic Acid	R	R
B	Diethyl Ketone	V	U	*	Hydrofluoric Acid(40-60%)	R	R
A	Diethylene Glycol	R	V		Hydrogen (100%)	R	R
A	Diglycolic Acid	R	R		Hydrogen Chloride (dry gas)	R	R
	Dimethylamine	U	U		Hydrogen Peroxide (3%)	R	V
P	Dioclylphthalate	R	U		Hydrogen Sulfide	R	R
	Disodium Phosphate	R	R		Hydroquinone	R	R
	Distilled Water	R	R		Hydroxylamine Sulfate	R	R
P	Esters	R	V		Hypochlorous Acid	R	R
P	Ethers	R	V	B	Inks	R	R
P	Ethyl Acetate(100%)	R	U	O	Iodine (in KI solution)	U	U
P	Ethyl Acrylate	R	V	A	Isopropyl Alcohol	V	U
A	Ethyl Alcohol	V	U	P	Jet Fuels JP4 and JP5	V	U
B,P	Ethyl Benzene	U	U	P	Kerosene	V	U
P	Ethyl Chloride	U	U		Kraft Liquors	R	R
P	Ethyl Ether	U	U		Lactic Acid (25%)	R	R
B, P	Ethylene Bromide	U	U		Lard Oil	R	R
B, P	Ethylene Chloride	U	U		Latex	R	R
B, P	Ethylene Chlorohydrin	U	U		Laureic Acid	R	V
B, P	Ethylene Dichloride	U	U	P	Lauryl Chloride	V	*
A	Ethylene Glycol	U	U		Lead Acetate	R	R
	Ethylene Oxide	R	V		Lead Chloride	R	R
	Ferric Chloride	R	R		Lead Nitrate	R	R
	Ferric Hydroxide	R	R		Lead Sulfate	R	R
	Ferric Nitrate	R	R	P	Linseed Oil	V	U
	Ferric Sulfate	R	R		Lithium Bromide	R	R
	Ferrous Chloride	R	R		Lubricating Oil	R	V
	Ferrous Sulfate	R	R		ASTM No 1, No. 2, No. 3		
	Fish Solubles	R	R				
	Fluoboric Acid	R	R				
O	Fluorine, Gas, Wet	U	U				
	Fluosilicic Acid (conc.)	R	V				



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		21° C (70° F)	60° C (140° F)			21° C (70° C)	60° C (140° F)
P	Machine Oil	R	V	O	Phosphoric Acid	R	R
	Magnesium Carbonate	R	R		Photographic Solutions	R	R
	Magnesium Chloride	R	R		Picric Acid	U	U
	Magnesium Citrate	R	R		Plating Solutions	R	R
	Magnesium Hydroxide	R	R		Brass	R	R
	Magnesium Nitrate	R	R		Cadmium	R	R
	Magnesium Sulfate	R	R		Copper	R	R
	Maleic Acid	R	R		Gold	R	R
	Mercuric Chloride	R	R		Lead	R	R
	Mercuric Cyanide	R	R		Nickel	R	R
P	Mercurous Nitrate	R	R	Silver	R	R	
	Mercury	R	R	Tin	R	R	
	Methane	R	*	Zinc	R	R	
	Methyl Alcohol	V	U	Potassium Bicarbonate	R	R	
	Methyl Chloride	U	U	Potassium Bichromate	R	R	
	Methyl Ethyl Ketone	R	V	Potassium Borate	R	R	
	Methyl Isobutyl Ketone	R	V	Potassium Bromate	R	R	
	Methyl Sulfate	R	R	Potassium Carbonate	R	R	
	Methyl Sulfuric Acid	R	R	Potassium Chlorate	R	R	
	Methylene Chloride (100%)	U	U	Potassium Chloride	R	R	
B,P	Milk	R	R	Potassium Chromate (40%)	R	R	
	Mineral Oils	R	R	Potassium Cyanide	R	R	
	Molasses	R	R	Potassium Dichromate (40%)	R	R	
P	Naphta	V	U	Potassium Ferri/Ferro Cyanide	R	R	
	Naphtalane	U	U	Potassium Fluoride	R	R	
P	Nickel Chloride	R	R	Potassium Hydroxide	R	R	
	Nickel Nitrate	R	R	Potassium Nitrate	R	R	
	Nickel Sulfate	R	R	Potassium Perborate	R	R	
	Nicotine (dilute)	R	R	Potassium Perchlorate (10%)	R	R	
O	Nitric Acid (0-10%)	R	V	Potassium Permanganate (20%)	R	R	
	Nitric Acid (10-98%)	U	U	Potassium Persulfate	R	R	
O	Nitric Acid, fuming	U	U	Potassium Sulfate	R	R	
P	Nitrobenzene(100%)	U	U	Potassium Sulfide	R	R	
P	Nitrous Oxide	R	*	Potassium Sulfite	R	R	
P	n-Octane	R	R	Propane	U	U	
P	Oleic Acid	U	U	Propargyl Alcohol	R	V	
	Oxalic Acid	R	R	n-Propyl Alcohol	V	U	
O	Oxygen	R	V	Propylene Dichloride (100%)	U	U	
O	Ozone	R	*	Propylene Glycol	R	V	
O	Perchloric Acid (10-70%)	U	U	Pyridine	R	U	
P	Perchloroethylene	R	U	Resorcinol	R	R	
P	Phenol	U	U	Salicylic Acid	R	R	
P	Phenylhydrazine	U	U	Sea Water	R	R	
P	Phenylhydrazine Hydrochloride	U	U	Selenic Acid	R	R	
				Sewage	R	R	
				Shortening	R	R	
				Silicic Acid	R	R	
				Silver Cyanide	R	R	
				Silver Nitrate Solution	R	R	
				Silver Sulfate	R	R	
				Soap Solution	R	R	



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	Sodium Acetate	R	R		Thionyl Chloride	U	U
	Sodium Benzoate (35%)	R	R		Titanium Tetrachloride	U	U
	Sodium Bicarbonate	R	R	P	Toluene	U	U
	Sodium Bisulfate	R	R	P	Tributylphosphate	V	V
	Sodium Bisulfite	R	R	P	Trichloroethylene	U	U
	Sodium Borate	R	R	B	Triethylene Glycol	R	V
	Sodium Bromide (dilute)	R	R		Trisodium Phosphate	R	R
	Sodium Carbonate	R	R	P	Turpentine	V	U
	Sodium Chlorate	R	R		Urea (0-30%)	R	R
	Sodium Chloride	R	R		Urine	R	R
	Sodium Cyanide	R	R	A	Vanilla Extract	R	V
	Sodium Dichromate	R	R		Vinegar	R	R
	Sodium Ferri/Ferro Cyanide	R	R		Vinyl Acetate	V	*
	Sodium Fluoride	R	R		Water	R	R
	Sodium Hydroxide	R	R		Water, Acid Mine	R	R
	Sodium Hypochlorite	R	R		Water, Salt and Sea	R	R
	Sodium Nitrate	R	R		Wetting Agents	R	R
	Sodium Nitrite	R	R	A	Whiskey	R	V
	Sodium Peroxide	R	*	B	Wines	R	V
	Sodium Sulfate	R	R	P	Xylene	R	V
	Sodium Sulfide	R	R		Yeast	R	R
	Sodium Sulfite	R	R		Zinc Bromide	R	R
	Sour Crude Oil	R	V		Zinc Carbonate	R	R
	Stannic Chloride	R	R		Zinc Chloride	R	R
	Stannous Chloride	R	R		Zinc Nitrate	R	R
	Starch Solution	R	R		Zinc Oxide	R	R
	Stearic Acid (100%)	R	R		Zinc Stearate	R	R
P	Stoddards Solvent	R	V		Zinc Sulfate	R	R
	Sulfur	R	R				
	Sulfur Dioxide, Dry or Wet	R	V				
	Sulfuric Acid (0-30%)	R	R				
O	Sulfuric Acid (30-98%)	U	U				
O	Sulfuric Acid, fuming (oleum)	U	U				
	Sulfurous Acid	R	R				
P	Tallow	R	V	R	- Resistant		
	Tannic Acid	R	R	V	- Variable resistance		
	Tanning Liquors	R	R	U	- Not resistant		
P	Tartaric Acid	R	R	*	- Insufficient data		
	Tetrahydrofuran	U	U		Refer to text for explanation of Resistance and Caution Codes.		

For further information on Abcite® grades, please contact:

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