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BECKMAN COULTER

Chemical Resistances for Beckman Coulter Centrifugation Products

CAUTION

The information provided here is from references, from current literature, or from research done by Beckman Coulter, Inc., and is only a guide for the selection of materials. No guarantee of safety based on these recommendations is expressed or implied. Many of the chemicals are explosive when concentrated or dry, or are toxic, caustic, allergenic, or carcinogenic. Observe proper handling as outlined by your laboratory safety officer.

INTRODUCTION

This table indicates the general chemical resistances of various materials to a number of chemicals commonly used in procedures involving Beckman Coulter centrifuges and accessories. You can select a chemical and determine the resistance of listed materials to the selected chemical—either satisfactory (S), marginally satisfactory (M), unsatisfactory (U), or unknown (X). Marginal resistance listings may be a combination of S and U resistances.

Materials are listed alphabetically. Chemicals are listed alphabetically by their most common name within seven categories (acids, bases, salts, gradient-forming materials, solvents, detergents, and other). Where applicable, an IUPAC (International Union of Pure and Applied Chemistry) name is shown beneath a trivial chemical name. Chemicals are either undiluted liquids or saturated (unless otherwise noted) aqueous solutions. Materials that have unsatisfactory or marginal resistance to the high concentrations used for these tests may be usable in very low (that is, millimolar) concentrations.

TEST YOUR SOLUTION UNDER OPERATING CONDITIONS IF MATERIAL PERFORMANCE IS UNCERTAIN.

Soak tests at $1 \times g$ (at 20°C) established the data for most of the materials. In some cases the resistances of tube materials also reflect their performance under centrifugation. Thus, although alcohols (for example) may be stored satisfactorily in polycarbonate or in Ultra-Clear containers, ethanol will destroy these tubes in a short period of high-speed centrifugation. This combination of material and chemical is therefore listed as U in the table. Not all combinations have been tested under the stress of centrifugation, however. Again, pretesting under actual run conditions is strongly advised.

The data for centrifuge and rotor finishes is derived mainly from splash tests in which the finish was exposed to the chemical for a matter of minutes. Satisfactory resistance under long-term exposure should not be assumed.

DECONTAMINATION OF ALUMINUM ROTORS AND ACCESSORIES

While a number of solutions are commercially marketed for use in removing radioactivity from contaminated materials, many are too harsh for use on anodized aluminum. Beckman Coulter has tested a number of solutions and found two that do not harm anodized aluminum:

- IsoClean Solution (for soaking) or RadCon Surface Spray (In U.S.A., contact Nuclear Associates [New York]; in Eastern Europe and Commonwealth States, contact Victoreen GmbH [Munich]; in South Pacific, contact Gammasonics Pty. Ltd. [Australia]; in Japan, contact Toyo Medic Co. Ltd. [Tokyo].)
- Radiacwash (In U.S.A., contact Biodex Medical Systems [Shirley, New York]; internationally, contact the U.S. office to find the dealer nearest you.)

While Beckman Coulter has tested these methods and found that they do not damage components, no guarantee of decontamination is expressed or implied. Consult your laboratory safety officer regarding the proper decontamination methods to use.

If a rotor and/or accessories are contaminated with toxic or pathogenic solutions, follow appropriate sterilization or disinfection procedures as outlined by your laboratory safety officer.

REGISTERED TRADEMARKS

Chemicals IUPAC Name	acetal copolymer (celcon)	acrylic (plexiglass)	alumina (Al_2O_3)	aluminum[7]	anodic coating[7]	nitrile rubber (Buna N)	acetal homopolymer (Delrin)	synthetic rubber (EPDM)	epoxy resin	epoxy resin/carbon composite	polyethylene terephthalate polyester film (Mylar)	neoprene	polyphenylene oxide (PPO) (Noryl)	nylon (6, 6/6)	paint, water-based	polyethylene terephthalate (PET)	polycarbonate	polyethylene (HDPE)	polyethelene (LDPE)	polypropylene	polystyrene	polysulfone	polyurethane liner	polyurethane paint	polyvinyl chloride (PVC)	polyphenylsufone (PPSU) (Radel)	teflon (PTFE) (Rulon A)	silicone elastomer (RTV) (Silastic)	silicone rubber	stainless steel	titanium	flexible polyvinyl chloride (PVC) (Tygon)	polyetherimide (PEI) (Ultem)	polyethylene terephthalate glycol (PETG) (Ultra-Clear)	synthetic rubber (Viton)	polyphenylene sulfide (PPS)
ACIDS (aq)																																				
acetic acid (5%) ethanoic acid	S	S	S	S	S	S	S	S	S	S	S	S	S	M[1]	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	M	S	S	S	U	S	S
acetic acid (60%) ethanoic acid	U	U	S	S	S	S	U	S	S	S	S	S	S	U	S	S	U	M	M	M	M	S	M	S	U	S	S	S	M	U	S	M	M	U	M	S
acetic acid (glacial) ethanoic acid	U	U	S	S	S	S	U	M	S	S	S	U	S	U	M	S	U	U	U	U	3	U	U	U	S	U	M	S	S	U	U	S	M	U	U	U	S
boric acid	S	S	S	U	S	S	U	S	S	S	S	S	S	M[8]	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S
chromic acid (10%)	U	S	S	U	S	U	U	U	U	U	S	U	S	U	S	S	S	U	U	S	M	U	U	S	U	X	S	S	U	U	S	S	S	S	S	S
citric acid 2-hydroxy-1,2,3-propane tricarboxylic acid	S	S	S	M	S	S	U	S	S	S	S	S	S	M	S	S	S	S	M	S	M	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S
hydrochloric acid (10%)	U	S	M	U	U	M	U	S	S	S	S	S	S	U	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S	U	M	S	S	M	S	S
hydrochloric acid (50%)	U	U	S	U	U	M	U	M	U	U	U	M	S	U	S	U	U	S	S	S	M	S	S	S	M	S	S	S	M	M	U	U	M	S	U	S	X
iodoacetic acid 2-iodoethanoic acid	S	U[1]	S	S	S	M	S[1]	S	S	S	S[1]	M	S	S[1]	U	S	S	S[1]	S	S[1]	S[1]	S[1]	U	S[1]	S	X	S	M	M	S	S	M	S	M[1]	M	X
mercaptoacetic acid 2-mercaptoethanoic acid	S	U	S	U[4]	S	U	S	X	M	M	S	M	S	U	U	S	U	U	U	U	S	S	U	U	M[1]	X	S	U	U	S	S	S	S	U	S	X
nitric acid (10%)	U	S	M	U	S	U	U	M	U	U	S	U	S	U	S	S	S	S	S	S	S	U	S	U	S	S[2]	S	S	S	M	S	S	S	S	M	S	S
nitric acid (50%)	U	U	S	U	S	U	U	U	U	U	U	U	S	U	U	U	M	M	M	S	U	U	U	U	S[2]	U	S	M	U	S	S	M	M	U	S	U
oleic acid *cis*-9-octadenoic acid	S	S	S	S	X	S	U	M	S	S	X	U	S	S	S	X	S	M	M	S[2]	M	S	S	M	S	S	S	X	U	U	S	U	S	S	M	S

S = satisfactory resistance

M = marginal resistance

U = unsatisfactory resistance

X = unknown

= Flammability hazard. The Centrifuge instrument is not designed for use with materials capable of developing flammable or explosive vapors, or with materials which could react chemically with sufficient vigor to cause a HAZARD. Do not centrifuge such materials nor handle or store them near the centrifuge. Vapors may be ignited by exposure to electrical contacts. Depending on the centrifuge type, such exposure could occur either during normal centrifugation or under failure conditions.

[1] discoloration

[2] below 26°C only

[3] explosion hazard due to possible material/chemical reaction under rotor failure conditions

[4] dilute solutions satisfactory

[5] below 21°C only

[6] nonaqueous

[7] most aluminum components have anodic coating finishes

[8] avoid high temperatures at high concentrations

[9] nickel acetate unsatisfactory

[10] vegetable oils may be marginal or unsatisfactory

Chemicals IUPAC Name	acetal copolymer (celcon)	acrylic (plexiglass)	alumina (Al_2O_3)	aluminum[7]	anodic coating[7]	nitrile rubber (Buna N)	acetal homopolymer (Delrin)	synthetic rubber (EPDM)	epoxy resin	epoxy resin/carbon composite	polyethylene terephthalate polyester film (Mylar)	neoprene	polyphenylene oxide (PPO) (Noryl)	nylon (6, 6/6)	paint, water-based	polyethylene terephthalate (PET)	polycarbonate	polyethylene (HDPE)	polyethelene (LDPE)	polypropylene	polystyrene	polysulfone	polyurethane liner	polyurethane paint	polyvinyl chloride (PVC)	polyphenylsufone (PPSU) (Radel)	teflon (PTFE) (Rulon A)	silicone elastomer (RTV) (Silastic)	silicone rubber	stainless steel	titanium	flexible polyvinyl chloride (PVC) (Tygon)	polyetherimide (PEI) (Ultem)	polyethylene terephthalate glycol (PETG) (Ultra-Clear)	synthetic rubber (Viton)	polyphenylene sulfide (PPS)
ACIDS (continued) **oxalic acid** ethanedioic acid	U	S	S	U	U	M	U	S	S	S	S	S	S	M	S	S	U	S	M	S	S	S	S	S	S	S	S	S	M	U	S	S	S	U	S	S
perchloric acid (70%)	U	S	S	U	U	U	U	M	U	3	S	U	M	U	S	S	U	M	M	M	U	U	U	S	M	X	S	U	U	U	S	U	U	U	S	X
phosphoric acid mixture (10%)	U	S	M	U	U	M	U	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	M	S	S	X	S	S	S	M	U	S	S	S	S	S
phosphoric acid mixture (50%)	U	S	M	U	U	U	U	S	M	M	S	U	S	U	S	S	S	S	S	S	S	S	U	S	S	X	S	S	U	U	U	S	S	S	S	S
picric acid 2,4,6-trinitrophenol	S	U	S	S	S	U	S[1]	M	M	M	S	M	S	U	S	S	S	S	U	S	S	S	U	S[1]	U	U	S	S[1]	U	M	S	M[1]	X	S	S	X
saturated fatty acids	S	U	S	S	X	S	S	M	S	S	X	S	S	S	S	X	S	S	M	S	S	S	S	M	S	S	S	S	M	M	S	S	X	S	S	X
stearic acid octadecanoic acid	S	U	S	U	X	S	S	M	S	S	X	M	S	S	S	X	S	S	M	S	S	S	S	M	S	S	S	S	M	M	S	S	S	X	S	X
sulfosalicylic acid 3-carboxy-4-hydroxy-benzenesulfonic acid	S	S	S	U	U	S	S	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	X	S	S	S	S	S	S	U	S	S	S	S	S	X
sulfuric acid (10%)	U	S	M	U	U	M	U	M	U	U	S	S	S	U	S	S	S	S	S	S	S	S	S	M	S	S	S	S	U	U	U	S	S	S	S	S
sulfuric acid (50%)	U	U	M	U	U	U	U	U	U	U	M	M	S	U	S	M	U	S	S	S	S	S	M	U	S	S	S	S	U	U	U	U	S	U	S	M
thiogylycolic acid	U	U	S	U[4]	S	U	S	X	M	S	S	M	S	U	U	S	U	U	U	U	S	U	U	U	M[1]	X	S	U	U	S	S	S	X	U	U	X
tricloroacetic acid trichloroethanoic acid	U	U	S	U	U	U	U	M	S	S	U	U	S	U	M	U	M	S[2]	U	S	U	U	U	S	U	X	S	U	U	U	U	M	X	U	U	S
unsaturated fatty acids	S	S[2]	S	S	X	S	U	M	S	S	X	U	X	S	S	X	S	M	M	S[2]	M	M	S	M	S	S	S	X	M	U	S	M	S	S	M	X
BASES (aq) **ammonium hydroxide (10%)**	S	S	S	U	U	S	U	S	S	S	U	S	S	U	S	U	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	M	U	S	X
Imidazole, Amine	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	U	S	S	S	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	M

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BASES (aq) (continued) **ammonium hydroxide (28%)**	S	S	S	U	U	M	U	S	M	M	U	S	S	U	S	U	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	U	U	S	X
aniline benzenamine	S	U	S	S	S	U	S	M	U	U	S	U	U	U	M	S	U	U	U	S	U	U	U	U	U	X	S	M	U	S	S	U	U	U	S	S
potassium hydroxide (5%)	S	M	S	U	U	S	U	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	M	U	S	S	S	M	U	S
potassium hydroxide (45%)	S	U	S	U	U	S	U	S	S	U	M	S	S	U	S	M	U	S	S	U	M	S	M	S	S	S	S	S	M	U	U	S	S	U	U	S
pyridine (50%) azabenzene	M	U	S	U	S	U	M	M	U	U	S	U	U	S	U	S	U	U	U	S	U	U	U	S	U	X	S	S	U	U	U	U	U	U	U	S
sodium hydroxide (1%)	S	S	M	U	U	S	U	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	S
sodium hydroxide (>1%)	S	S	M	U	U	S	U	S	S	S	U	S	S	U	S	U	U	S	S	S	S	S	S	M	S	S	S	S	S	S	S	M	S	U	U	S
SALTS (aq) **aluminum chloride**	U	S	S	U	U	S	U	S	S	S[2]	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	M	U	U	S	S	S	S	S
ammonium acetate ammonium ethanoate	S	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	U	X
ammonium carbonate	S	S	S	M	S	U	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S
ammonium phosphate	S	S	S	U	X	S	S	S	S	S	X	S	S	S	S	X	S	S	S	S	S	S	S	X	S	S	S	X	S	M	S	S	S	S	S	S
ammonium sulfate	S	S	S	U	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	U	S
barium salts	S	S	S	M	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S
calcium chloride	S	S	M	M	U	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S
guanidine hydrochloride 1-aminomethanamidine hydrochloride	S	S	S	U	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	X	S	S	S	S	S	S	U	S	S	S	S	S	X

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SALTS (aq) (continued)																																			
magnesium chloride	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
nickel salts	S	S	S	U	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S[9]	S
potassium bromide	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S
potassium carbonate	S[2]	M[1]	S	M	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
potassium chloride	S	S	M	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S	S
potassium permanganate	S	S[2]	S[1]	S	S	S	S	S	S	S	S	S[4]	S	U	S	S	S	S	S	S[2]	M	S[1]	U	M	U	S	S	S[1]	S[1]	M	S	U	S	S[1]	M	S
silver nitrate	S	S	S	U	S	M	S	S	S	S	S	S[4]	S	S	S	S	S	S	S	S	S	S	X	M	S	S	S	S	S	M	S	S	S	S	S	S
sodium borate	S	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	M	S	S	S	S	S
sodium carbonate	S	S	S	M	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
sodium chloride	S	S	S	U	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S
sodium nitrate	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	U	S	S	S	S	S	M	S	S	S	S	S	U	S	S	S	S	S	S	S
sodium sulfate	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	M	S	S	S	S	S	S
sodium sulfite	S	S	S	S[2]	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	X
zinc chloride	S	S	S	U	U	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S	S	U	S	S	S	S	S	S
zinc sulfate	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S
GRADIENT FORMING MATERIALS (aq)																																			
cesium acetate cesium ethanoate	S	S	S	M	X	S	S	S	S	S	X	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S	S	M	S	S	S	X	S	X
cesium bromide	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	X

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Chemicals IUPAC Name	acetal copolymer (celcon)	acrylic (plexiglass)	alumina (Al_2O_3)	aluminum[7]	anodic coating[7]	nitrile rubber (Buna N)	acetal homopolymer (Delrin)	synthetic rubber (EPDM)	epoxy resin	epoxy resin/carbon composite	polyethylene terephthalate polyester film (Mylar)	neoprene	polyphenylene oxide (PPO) (Noryl)	nylon (6, 6/6)	paint, water-based	polyethylene terephthalate (PET)	polycarbonate	polyethylene (HDPE)	polyethelene (LDPE)	polypropylene	polystyrene	polysulfone	polyurethane liner	polyurethane paint	polyvinyl chloride (PVC)	polyphenylsufone (PPSU) (Radel)	teflon (PTFE) (Rulon A)	silicone elastomer (RTV) (Silastic)	silicone rubber	stainless steel	titanium	flexible polyvinyl chloride (PVC) (Tygon)	polyetherimide (PEI) (Ultem)	polyethylene terephthalate glycol (PETG) (Ultra-Clear)	synthetic rubber (Viton)	polyphenylene sulfide (PPS)
GRADIENT FORMING MATERIALS (aq) (cont'd)																																			
cesium chloride	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	X
cesium formate cesium methanoate	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	X	S	S	S	S	S	S	M	S	S	S	S	S	X
cesium iodide	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	X
cesium sulfate	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	M	S	S	S	S	S	X
dextran or dextran sulfate	S	S	S	M	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S	X	S	S	S	S	S	S	M	S	S	S	S	S	X
Ficoll-Paque	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	X
glycerol 1,2,3-propanetriol	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	X
metrizamide	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	X	S	S	S	S	S	S	M	S	S	S	S	S	X
rubidium bromide	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	X
rubidium chloride	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	X
sodium bromide	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	X
sodium iodide	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	X
sucrose β-D-fructofuranosyl-α-D-glucopyranoside	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
sucrose, alkaline β-D-fructofuranosyl-α-D-glucopyranoside	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	U	S	S

S = satisfactory resistance

M = marginal resistance

U = unsatisfactory resistance

X = unknown

= Flammability hazard. The Centrifuge instrument is not designed for use with materials capable of developing flammable or explosive vapors, or with materials which could react chemically with sufficient vigor to cause a HAZARD. Do not centrifuge such materials nor handle or store them near the centrifuge. Vapors may be ignited by exposure to electrical contacts. Depending on the centrifuge type, such exposure could occur either during normal centrifugation or under failure conditions.

[1] discoloration

[2] below 26°C only

explosion hazard due to possible material/chemical reaction under rotor failure conditions

[4] dilute solutions satisfactory

[5] below 21°C only

[6] nonaqueous

[7] most aluminum components have anodic coating finishes

[8] avoid high temperatures at high concentrations

[9] nickel acetate unsatisfactory

[10] vegetable oils may be marginal or unsatisfactory

Chemicals IUPAC Name	acetal copolymer (celcon)	acrylic (plexiglass)	alumina (Al_2O_3)	aluminum[7]	anodic coating[7]	nitrile rubber (Buna N)	acetal homopolymer (Delrin)	synthetic rubber (EPDM)	epoxy resin	epoxy resin/carbon composite	polyethylene terephthalate polyester film (Mylar)	neoprene	polyphenylene oxide (PPO) (Noryl)	nylon (6, 6/6)	paint, water-based	polyethylene terephthalate (PET)	polycarbonate	polyethylene (HDPE)	polyethelene (LDPE)	polypropylene	polystyrene	polysulfone	polyurethane liner	polyurethane paint	polyvinyl chloride (PVC)	polyphenylsufone (PPSU) (Radel)	teflon (PTFE) (Rulon A)	silicone elastomer (RTV) (Silastic)	silicone rubber	stainless steel	titanium	flexible polyvinyl chloride (PVC) (Tygon)	polyetherimide (PEI) (Ultem)	polyethylene terephthalate glycol (PETG) (Ultra-Clear)	synthetic rubber (Viton)	polyphenylene sulfide (PPS)
SOLVENTS																																				
acetone 2-propanone	M	U	S	M	S	U	S	S	U	U	M	U	U	S	U	M	U	S	S	S	U	U	U	M	U	M	S	U	M	M	S	U	S	U	U	S
acetonitrile ethanenitrile	S	U	S	S	S	U	S	U	M	M	S	S	U	S	U	S	U	S	S	S	U	U	U	U	M	M	S	S	S	S	S	U	X	U	U	X
benzene	M	U	S	S	S	U	M	U	U	U	S	U	U	S	U	S	U	U	U	U	U	U	U	S	U	M	S	U	U	M	S	U	X	U	S	S
carbon tetrachloride tetrachloromethane	S	U	S	[3]	[3]	M	S	U	U	U	S	U	U	S	S	S	U	U	U	U	U	S	U	S	U	S	M	U	U	U	[3]	U	S	U	S	S
chloroform trichloromethane	S	U	S	[3]	[3]	U	S	U	S	S	S	U	U	U	S	S	U	U	U	U	U	U	U	M	U	U	S	U	U	U	[3]	U	U	U	U	M
cresol mixture methylphenol	S	U	S	S	S	U	S	U	U	U	S	U	U	U	U	S	U	U	U	U	U	U	U	U	U	X	S	S	U	S	S	U	X	U	S	S
cyclohexane	S	U	S	S	S	S	S	U	S	S	S	U	U	S	S	S	U	U	U	U	U	M	U	S	U	S	S	U	U	M	M	U	S	U	S	S
diethyl ether ethoxyethane	S	U	S	S	S	U	S	U	S	S[2]	S	U	U	S	S	S	U	U	U	U	U	U	U	S	U	S	S	U	S	U	S	U	S	U	U	S
diethyl ketone 3-pentanone	S	U	S	S	X	U	S	M	M	M	X	U	U	S	U	X	U	U	U	M	U	U	U	S	U	M	S	X	U	M	S	U	S	U	U	X
N,N-dimethylformamide N,N-dimethylmethanamide	S	U	S	S	S	M	S	M	M	M	S	U	U	S	S	S	U	S	S	S	U	U	U	S	U	X	S	S	M	S	S	U	X	U	U	S
dimethyl sulfoxide sulfinylbis[methane]	S	M	S	S	S	U	S	S	S	S	S	U	S	S	S	S	U	S	S	S	S	U	U	S	U	X	S	U	S	S	S	U	X	U	U	X
dioxane 1,4-dioxacyclohexane	S	U	S	M	S	U	M	M	S	S	S	U	U	S	U	S	U	U	U	S	U	U	U	S	U	X	S	S	U	S	S	U	X	U	U	X

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[2] below 26°C only

[3] explosion hazard due to possible material/chemical reaction under rotor failure conditions

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SOLVENTS (continued)																																				
ethanol (50%) 🔥	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	M	S	S	S	S	S	S	M	S	M	S	M	S	U	S	S
ethanol (95%) 🔥	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	S[5]	S	S	M	S	S	S	S	S	S	M	S	M	S	M	S	U	S	S
ether	S	U	S	S	S	U	S	U	S	S[2]	S	U	U	S	S	S	U	U	U	U	S	U	U	S	U	S	S	U	S	M	S	M	S	U	U	S
ethyl acetate ethyl ethanoate 🔥	S	U	S	M	S	U	S	M	M	M	S[1]	U	U	S	U	S	U	U	U	S	U	U	U	S	U	S	S	U	M	M	S	U	S	U	U	S
ethylene glycol 1,2-ethanediol	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	S	M	S	S	S	S	S	S	S	S	S	S	S	M	S	M[5]	S	S	S
hexane 🔥	S	S	S	S	S	S	S	U	S	S[2]	S	S	U	S	S	S	U	U	U	M[1]	U	S	S	S	U	S	S	U	U	S	S	U	S	U	S	S
isopropyl alcohol 2-propanol 🔥	S	U	S	M	S	S	S	S	S	S[2]	S	M	S	S	S	S	U	S	S	S	M	S	S	S	S	S	S	S	M	S	M	S	M	S	S	S	S
kerosene 🔥	S	S	S	S	S	S	S	U	S	S	S	U	3	S	S	S	U	U	U	U	U	S	S	S	S	S	S	S	U	U	S	S	U	S	U	S	S
methanol 🔥	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	S	M	S	M	M	S	S	S	S	S	M	S	M	S	M	S	U	M	S
methylene chloride dichloromethane	M	U	S	3	3	U	S	U	U	S	S	U	U	U	U	S	U	U	U	U	U	U	U	S	U	S	S	U	U	M	3	U	U	U	M	M
methyl ethyl ketone 2-butanone 🔥	S	U	S	S	S	U	S	S	M	M	S	U	U	S	U	S	U	U	U	S[2]	U	U	U	M	U	M	S	U	U	S	S	U	S	U	U	M
phenol (5%) 🔥	U	U	S	U	S	U	M	M	M	M	S	U	M	U	M	S	U	U	U	S	M	U	U	M	U	U	S[4]	U	U	U	S	M	S	U	S	S
phenol (50%) 🔥	U	U	S	U	S	U	U	U	U	U	U	U	M	U	U	U	U	U	U	S[2]	U	U	U	M	U	U	S	U	U	U	S	M	S	U	S	S[11]
tetrahydrofuran 🔥	M	U	S	S	S	U	U	U	U	U	S	U	U	S	U	S	U	U	U	U	U	U	U	U	U	S	S	U	U	S	S	U	X	U	U	S
toluene methylbenzene 🔥	S	U	S	S	S	U	S	U	M	M	S	U	U	S	S	S	U	U	U	U	U	U	U	M	U	M	S	U	U	S	S	U	S	U	S	S

S = satisfactory resistance

M = marginal resistance

U = unsatisfactory resistance

X = unknown

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3 explosion hazard due to possible material/chemical reaction under rotor failure conditions

[4] dilute solutions satisfactory

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[6] nonaqueous

[7] most aluminum components have anodic coating finishes

[8] avoid high temperatures at high concentrations

[9] nickel acetate unsatisfactory

[10] vegetable oils may be marginal or unsatisfactory

[11] satisfactory resistance when exposed to phenol (70%)

Chemicals IUPAC Name	acetal copolymer (celcon)	acrylic (plexiglass)	alumina (Al_2O_3)	aluminum[7]	anodic coating[7]	nitrile rubber (Buna N)	acetal homopolymer (Delrin)	synthetic rubber (EPDM)	epoxy resin	epoxy resin/carbon composite	polyethylene terephthalate polyester film (Mylar)	neoprene	polyphenylene oxide (PPO) (Noryl)	nylon (6, 6/6)	paint, water-based	polyethylene terephthalate (PET)	polycarbonate	polyethylene (HDPE)	polyethelene (LDPE)	polypropylene	polystyrene	polysulfone	polyurethane liner	polyurethane paint	polyvinyl chloride (PVC)	polyphenylsufone (PPSU) (Radel)	teflon (PTFE) (Rulon A)	silicone elastomer (RTV) (Silastic)	silicone rubber	stainless steel	titanium	flexible polyvinyl chloride (PVC) (Tygon)	polyetherimide (PEI) (Ultem)	polyethylene terephthalate glycol (PETG) (Ultra-Clear)	synthetic rubber (Viton)	polyphenylene sulfide (PPS)
SOLVENTS (continued)																																				
water	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
xylene mixture dimethylbenzene 🔥	S	U	S	S	S	U	S	U	S	S	S	U	U	S	U	S	U	U	U	M[2]	U	U	U	S	U	M	S	U	U	M	S	U	S	U	S	S
DETERGENTS																																				
Aidex	S	S	S	X	X	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	X	S	S	S	S	S	S	S	S	S	M	S	S
Alconox	S	S	S	U	U	S	S	S	S	S	S	S	S	S	S	S	U	U	U	S	U	S	S	U	S	S	S	S	S	S	S	S	S	M	S	S
Contrad 70	S	S	X	X	X	S	S	S	S	S	X	S	S	S	X	S	U	S	M	S	U	S	X	X	S	S	S	S	S	X	X	S	S	M	S	S
Deconex 13	S	S	X	X	X	S	S	S	S	S	S	S	S	S	X	S	X	S	M	S	S	S	X	S	S	S	S	S	S	X	X	S	S	M	S	S
deoxycholate, sodium dodecyl sulfate, Triton X-100	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	M	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S
Dove	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Haemo-Sol	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	S	M	S	M	S	X	U	S	S	S	S	S	S	S	S	S	S	S	S
IsoClean	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	S	M	S	U	S	X	S	S	S	S	S	S	S	S	S	S	M	S	S
Ivory	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Joy	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Liquinox	S	S	X	X	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S	X	X	S	S	M	S	S
LpHse	S	S	X	X	X	S	S	S	S	S	S	S	S	S	X	S	U	S	M	S	U	S	X	S	S	S	S	S	S	X	X	S	S	M	S	S
Solution 555 (20%)	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	X	S	S	S	S	S	S	S	S	S	S	S	S	S
Trace Kleen	S	S	X	X	X	S	S	S	S	S	S	S	S	S	X	S	U	S	M	S	U	S	X	S	S	S	S	S	S	X	X	S	S	M	S	S

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DETERGENTS (continued)																																				
Vesphen 11	S	S	X	X	X	S	S	S	S	S	S	S	S	S	X	S	U	S	M	S	U	S	X	S	S	S	S	S	S	S	X	X	S	S	M	S	S
Wescodyne	S	S	X	X	X	S	S	S	S	S	S	S	S	S	X	S	U	S	M	S	U	S	X	S	S	S	S	S	S	S	X	X	S	S	M	S	S
Zephiran chloride (1%)	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	X	S	S	S	S	S	S	S	S	S	U	S	M	S	S
OTHER																																				
***n*-butyl phthalate**[6] dibutyl 1,2-benzenedicarboxylate	S	U	S	S	S	U	S	S	X	S	S	U	U	S	S	S	U	U	U	U	U	U	S	S	U	X	S	U	M	M	S	U	X	M	S	M
dibutyl phthalate	S	S	S	S	S	U	S	S	X	S	S	U	U	S	S	S	U	U	U	U	U	S	X	S	U	S	S	U	M	M	S	U	S	X	S	X
diethyl pyrocarbonate pyrocarbonic acid diethyl ester	S	M	S	S	S	U	S	X	S	S	S	S	U	S	S	S	U	S	S	S	U	S	X	U	M[1]	S	S	S	S	S	S	S	S	U	S	X
ethylene oxide vapor[6] oxirane 🔥	X	S	X	S	X	U	X	U	U	U	X	U	X	S	M	S	S	S	S	S	U	S	X	S	U	S	S	U	U	S	S	S	S	U	U	U
formaldehyde methanal	S	S	S	S	S	S	S	S	S	S	S	S	S	S	X	S	S	S	S	S	U	S	U	S	S	S	S	S	S	M	S	M	S	S	S	S
formalin (40%)	X	S	S	S	S	S	X	X	S	S	S	U	S	S	S	S	S	S	M	S	U	S	U	S	S	S	S	S	M	M	S	M	S	S	S	X
hydrogen peroxide (3%)	S	S	S	S	U	S	S	S	U	U	S	S[2]	S	U	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S
hydrogen peroxide (10%) 💥3	U	S	S	U	U	S	U	U	U	U	S	S[2]	S	U	S	S	S	S[2]	S	S	S	S	S	U	S	S	S	S	S	M	S	U	S	S	S	S
2-mercaptoethanol 🔥	S	U	S	S	S	U	S	S	M	M	S	U	U	S	U	S	S	S	S	S	S	S	U	U	S	X	S	U	S	S	S	S	S	U	S	X

S = satisfactory resistance

M = marginal resistance

U = unsatisfactory resistance

X = unknown

🔥 = Flammability hazard. The Centrifuge instrument is not designed for use with materials capable of developing flammable or explosive vapors, or with materials which could react chemically with sufficient vigor to cause a HAZARD. Do not centrifuge such materials nor handle or store them near the centrifuge. Vapors may be ignited by exposure to electrical contacts. Depending on the centrifuge type, such exposure could occur either during normal centrifugation or under failure conditions.

[1] discoloration

[2] below 26°C only

💥3 explosion hazard due to possible material/chemical reaction under rotor failure conditions

[4] dilute solutions satisfactory

[5] below 21°C only

[6] nonaqueous

[7] most aluminum components have anodic coating finishes

[8] avoid high temperatures at high concentrations

[9] nickel acetate unsatisfactory

[10] vegetable oils may be marginal or unsatisfactory

Chemicals IUPAC Name	acetal copolymer (celcon)	acrylic (plexiglass)	alumina (Al_2O_3)	aluminum[7]	anodic coating[7]	nitrile rubber (Buna N)	acetal homopolymer (Delrin)	synthetic rubber (EPDM)	epoxy resin	epoxy resin/carbon composite	polyethylene terephthalate polyester film (Mylar)	neoprene	polyphenylene oxide (PPO) (Noryl)	nylon (6, 6/6)	paint, water-based	polyethylene terephthalate (PET)	polycarbonate	polyethylene (HDPE)	polyethelene (LDPE)	polypropylene	polystyrene	polysulfone	polyurethane liner	polyurethane paint	polyvinyl chloride (PVC)	polyphenylsulfone (PPSU) (Radel)	teflon (PTFE) (Rulon A)	silicone elastomer (RTV) (Silastic)	silllicone rubber	stainless steel	titanium	flexible polyvinyl chloride (PVC) (Tygon)	polyetherimide (PEI) (Ultem)	polyethylene terephthalate glycol (PETG) (Ultra-Clear)	synthetic rubber (Viton)	polyphenylene sulfide (PPS)
OTHER (continued) **oils (petroleum)**	S	S	S	S	X	S	S	U	S	S	S	M	S	S	S	S	M	U	S	U	U	S	S	S	S	S	S	M	U	S	S	M	S	S	S	S
oils (other)	S	S[10]	S	S	S	S	S	U	S	S	S	U	S[10]	S	S	S	M	U	U	S	U	S	S	X	S	S	S	S	M	S	S	M	S	M	S	S
physiologic media (e.g., culture media, milk, serum, urine)	S	S	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S	S	X
sodium hypochlorite (5 1/4% solution; unscented commercial bleach)	U	S	M	U	S	M	U	S	S	S	S	U	S	U	S	S	S	S	S	S	M[4]	S	S	U	M	S	S	S	S	M	U	S	M	S	S	S	S
Tris buffer (neutral pH) tris (hydroxymethyl) aminomethane	S	S	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	X
urea	S	S	S	S	S	U	S	S	X	X	S	S	S	S	S	S	S	S	S	S	S	S	M	X	S	S	S	S	S	S	M	S	S	S	S	S	S

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GLOSSARY OF TERMS

anodized coating	a thin, hard layer of aluminum oxide formed electrochemically on aluminum rotor and/or accessory surfaces as a protective coating for corrosion resistance
Buna N	black nitrile rubber used for O-rings and gaskets in rotor assemblies
Delrin	thermoplastic material (acetal homopolymer) used for most tube adapters
EPDM	ethylene propylene rubber used for O-rings and pad adapters
HDPE	high density polyethylene used for adapters
LDPE	low density polyethylene used for tubes and bottles
neoprene	black synthetic elastomer used for O-rings in some tube caps and bottle cap assemblies
Noryl	modified thermoplastic polyphenylene oxide (PPO) used for floating spacers (part of the *g*-Max system) and some polycarbonate bottle caps
PET	polyethylene terephthalate used in some adapters
Polyphenylene Sulfide	(PPS) used in cap closures and other products as specified
Radel	polyphenylsulfone (PPSU) used in plugs, cap closures, cannisters, and other accessories
Ultem	polyetherimide (PEI) used in adapters, covers, and spacers
Viton	fluorocarbon elastomer used in high-temperature applications

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