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Chemical Resistances for Beckman Coulter Centrifugation Products

PUBLISHED BY THE SPINCO BUSINESS CENTER OF BECKMAN COULTER, INC., PALO ALTO, CALIFORNIA 94304

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

Alconox	Alconox, In.
Delrin	E.I. Du Pont de Nemours & Company
Ficoll-Pacque	Pharmacia Fine Chemicals
Freon	E.I. Du Pont de Nemours & Company
Haemo-Sol	Meinecke & Co., Inc.
Hytrel	E.I. Du Pont de Nemours & Company
Mylar	E.I. Du Pont de Nemours & Company
Noryl	GE Plastics
Plexiglass	Rohm and Haas Co.
Polyallomer	Eastman Chemical Company
Radel	BP Amoco
Rulon	Furen Corp.
Silastic	Dow Corning Corp.
Teflon	E.I. Du Pont de Nemours & Company
Triton X-100	Rohm and Haas Co.
Tygon	Norton Performance Plastics
Ultem	General Electric
Viton	Du Pont Dow Elastomers
Zephiran Chloride	Winthrop Laboratories, Sterling Drug Co.

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

M = marginal resistance

U = unsatisfactory resistance

X = unknown

= Flammability hazard. Not recommended for use in any type of centrifuge because 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] discloloration

[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]	Buna N	copolymer (polyallomer)	Delrin (acetal homopolymer)	EPDM	epoxy resin	epoxy resin/carbon composite	Mylar	neoprene	Noryl (PPO)	nylon (6, 6/6)	paint, water-based	PET	polycarbonate	polyethylene (HDPE)	polyethelene (LDPE)	polypropylene (homopolymer)	polystyrene	polysulfone	polyurethane liner	polyurethane paint	polyvinyl chloride (PVC)	Radel (PPS)	Rulon A (Teflon)	Silastic (RTV)	silicone rubber	stainless steel	titanium	Tygon (flexible PVC)	Ultem	Ultra-Clear™	Viton
ACIDS (continued)																																			
oxalic acid ethanedioic acid	U	S	S	U	U	M	S	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
perchloric acid (70%)	U	S	S	U	U	U	M	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
phosphoric acid mixture (10%)	U	S	M	U	U	M	S	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
phosphoric acid mixture (50%)	U	S	M	U	U	U	S	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
picric acid 2,4,6-trinitrophenol	S	U	S	S	S	U	S	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
saturated fatty acids	S	U	S	S	X	S	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
stearic acid octadecanoic acid	S	U	S	U	X	S	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
sulfosalicylic acid 3-carboxy-4-hydroxy-benzenesulfonic acid	S	S	S	U	U	S	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
sulfuric acid (10%)	U	S	M	U	U	M	S	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
sulfuric acid (50%)	U	U	M	S	U	U	S	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
thiogylycolic acid	U	U	S	U[4]	S	U	S	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
tricloroacetic acid trichloroethanoic acid	U	U	S	U	U	U	S	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
unsaturated fatty acids	S	S[2]	S	S	X	S	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
BASES (aq)																																			
ammonium hydroxide (10%)	S	S	S	U	U	S	S[1]	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

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

S = satisfactory resistance

M = marginal resistance

U = unsatisfactory resistance

X = unknown

= Flammability hazard. Not recommended for use in any type of centrifuge because 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.

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[8] avoid high temperatures at high concentrations

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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	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S[9]
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	S	M	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
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	S	U	S	S	S	S
potassium permanganate	S	S[2]	S[1]	S	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
silver nitrate	S	S	S	U	S	M	S	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
sodium borate	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	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	S	M	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	S	M	S	S	S	S	S
sodium nitrate	S	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
sodium sulfate	S	S	S	U	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	M	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	S	M	S	S	S	S	S	S	S	S	S	S	S	S
zinc chloride	S	S	S	U	U	S	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
zinc sulfate	S	S	S	U	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	S	S	S	S	S	S
GRADIENT FORMING MATERIALS (aq)																																			
cesium acetate cesium ethanoate	S	S	S	M	X	S	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
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	S	M	S	S	S	S	S

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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	S	M	S	S	S	S	S
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	S	S	X	S	S	S	S	S	S	M	S	S	S	S
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	S	S	M	S	S	S	S
cesium sulfate	S	S	S	M	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	M	S	S	S	S
dextran or dextran sulfate	S	S	S	M	S	S	S	S	U	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
Ficoll-Paque	S	S	S	M	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	M	S	S	S	S
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	S
metrizamide	S	S	S	M	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	M	S	S	S	S
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	S	S	M	S	S	S	S
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	S	S	M	S	S	S	S
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	S	S	M	S	S	S	S
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	S	S	M	S	S	S	S
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	S	S	M	S	S	U	S

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[5] below 21°C only

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

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

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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
xylene mixture dimethylbenzene 🔥	S	U	S	S	S	U	M[2]	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
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	S	M	S
Alconox	S	S	S	U	U	S	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
Contrad 70	S	S	X	X	X	S	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
Deconex 13	S	S	X	X	X	S	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
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	S	M	S	M	S	S	M	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	S	M	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	S	U	S	M	S	M	S	X	U	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	S	U	S	M	S	U	S	X	S	S	S	S	S	S	S	S	S	S	M	S
Ivory	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	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	S	M	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	S	M	S	S	S	S	S	S	S	S	S	S	X	X	S	S	M	S
LpHse	S	S	X	X	X	S	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
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	S	X	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	S	X	S	U	S	M	S	U	S	X	S	S	S	S	S	S	X	X	S	S	M	S

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

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OTHER (continued)																																			
oils (petroleum)	S	S	S	S	X	S	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
oils (other)	S	S[10]	S	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
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	S	M	S	S	S	S	S
sodium hypochlorite (5 1/4% solution; unscented commercial bleach)	U	S	M	U	S	M	S[1]	U	S	S	S	S	U	S	U	S	S	S	S	S	M[4]	S	S	U	M	S	S	S	S	M	U	S	M	S	S	S
Tris buffer (netutral 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	S
urea	S	S	S	S	S	U	S	S	S	X	X	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 = satisfactory resistance

M = marginal resistance

U = unsatisfactory resistance

X = unknown

= Flammability hazard. Not recommended for use in any type of centrifuge because 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] discloloration

[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

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
Radel	polyphenylsulfone (PPS) 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