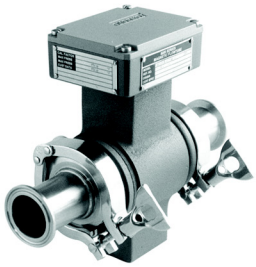
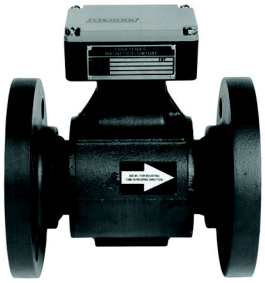
Foxboro
by Schneider Electric

Magnetic Flowtubes
Material Selection Guide









INTRODUCTION

The purpose of this Technical Information Sheet is to provide an aid in selecting the materials of construction of flowtube wetted parts (flowtube lining/body and electrode materials). The tables contained in this document have been designed to enable the user to select those materials which are considered to be most compatible with a particular process. The information is based on published data and/or experience. This data is offered as a guide only and is not to be construed as a specific recommendation by the company. For additional information or information on liquids not found in this guide, consult Corrosion Data Survey published by National Association of Corrosion Engineers (NACE), 1440 South Creek Drive, Houston, TX 77084.

ELECTRODE SELECTION

The selection of an electrode material for a magnetic flowtube can be critical due to the small size of the electrode and the integrity of the sealing that is required.

Small amounts of corrosion, which may be quite tolerable on large components, are intolerable on electrodes. Usually, corrosion rates in excess of 0.05 mm (0.002 in) are unacceptable for flowtube electrodes.

NOTES

1 Temperature factors should always be considered in selecting wetted materials. If no temperature is indicated for a given selection, the recommended electrode will generally tolerate the maximum temperature listed for the lining material.

2 Consider the process liquid to be concentrated when not otherwise specified. Diluted or low concentrations may be selectively handled by electrodes listed in the table as not recommended (specified by the letter "X").

FLOWTUBE MATERIALS AND CONSTRUCTION

Several standard choices of linings and electrode materials are offered.

Since all flowtube lining and electrode materials are not available in all models and sizes, it becomes necessary to choose process compatibility with available flowtube design and limitations, such as size, temperature, and flow rate.

Refer to Table 1 for a list of flowtube linings and line sizes for the 2800, 4700S, 8000A, 8300, 9100A, 9200A, 9300A, and MAG2 Series of Flowtubes. Refer to Table 2 for a general guide in selecting flowtube construction for a specific process fluid characteristic.

NOTES

1 **Maximum recommended temperatures** of process liquids in flowtubes, unless otherwise specified, are as listed below for the following linings:

Polyurethane	70°C (158°F)
Neoprene	95°C (203°F)
Sanitary (ptfe)	120°C (248°F)
Sanitary (ceramic)	175°C (347°F)
ptfe (a)	175°C (347°F)
Ceramic	205°C (401°F)
pfa (2800 Series)	175°C (347°F)
pfa (8000A/9300A)	180°C (356°F)
EPDM	95°C (203°F)
Natural Rubber (Linatex)	70°C (158°F)
Hard Rubber (Ebonite)	95°C (203°F)

a. For 9200A models, the ptfe maximum temperature is 100°C (212°F).

2 **Steam Cleaning** of any magnetic flowtube may cause premature failure of the flowtube, and therefore should be avoided or performed with extreme caution.

3 **Thermal Shock and Ceramic Flowtubes**; a sudden increase in temperature of more than 125 C° (225 F°), or decrease in temperature of more than 75 C° (135 F°) between the ceramic flowtube and the process or cleaning fluid (CIP) must be avoided. Refer to the Product Specification Sheets of the applicable flowtubes for details.

ELECTRODE MATERIALS

316 Ti ss/316L ss (UNS S31635)

- A good general purpose metal for water and sewage based applications
- Not compatible with acids and bases.

Hastelloy C-276 covered by ASTM B-574 specifications

- An alloy of low carbon nickel chromium and molybdenum
- Chemically resistant to both oxidizing and reducing media
- Good for sea water, slurries, and foodstuffs applications.

Platinum-Iridium (90-10%)/Platinum

- Unaffected by most process liquids
- Excellent chemical resistance due to platinum content
- Iridium provides the mechanical strength.

Titanium

- Compatible with sea water, chromic and nitric (40%) acids
- Often used for textile bleaching applications
- Not resistant to sulfuric and hydrochloric acids.

Tantalum

- Resistant to any acid solutions except hydrofluoric acid and fluosilicic acid
- Good corrosion properties
- Not very good abrasion properties.

Zirconium

- Corrosion resistant material against various chemicals, especially sulfides
- Not resistant to sulfuric and phosphoric acid.

Nickel

- Highly corrosion resistant against strong alkalis, especially highly concentrated caustic soda
- Often used for the highly concentrated caustic soda in pulp and paper and mining applications
- Not resistant to strong acids including hydrochloric, acetic, nitric, and sulfuric acids.

LINING MATERIALS

Neoprene

- Synthetic Rubber
- Generally used for sewage and potable water applications
- Abrasion resistance is good
- Temperature 0 to 95°C (32 to 203°F)

ptfe (polytetrafluoroethelene)

- Excellent chemical inertness
- Used in severe corrosion applications
- Used in mildly abrasive applications
- Temperature -20 to +180°C (-4 to 356°F)(1)

Polyurethane

- Chemically resistant to many process fluids but can swell up when specific chemicals are present
- Temperature 0 to 70°C (32 to 158°F)
- Suitable for sand, sludge, and other abrasive particles
- Excellent abrasion resistance.

EPDM (Ethylene Propylene Diene Rubber)

- Used for potable and sea water applications
- Used for mildly abrasive and corrosive fluids
- Temperature -10 to +95°C (14 to 203°F).

Natural Rubber (Linatex)

- Referred to as a Soft Rubber
- Often used for abrasive fluids mining slurries
- Temperature 0 to 70°C (32 to 158°F).

pfa (Perfluoroalkoxy polymer resin)

- Excellent blistering resistance
- Withstands the effect of severely corrosive fluids
- Moderately good abrasion resistance
- Temperature up to 175°C (347°F).

Ceramic

- Excellent corrosion and abrasion resistance
- Suitable for temperatures up to 175°C (347°F)
- Ideally suited for many food applications
- Versions available consistent with FDA material regulation for food contact service.

Ebonite (Hard Rubber)

- Good resistance to abrasion
- Good chemical resistance to acids and bases
- Temperature 0 to +95°C (32 to 203°F).

RATINGS IN TABLE 3

Table 3 is a selection guide for process wetted material versus process liquid. The ratings given in Table 3 attempt to combine the several variables which could influence the choice of materials for a particular fluid. Consultation with, or within, the user organization may reveal a suitability not listed here. It is therefore important that the final selection of materials be the user's responsibility.

The data in Table 3 includes letters, dashes, percentages, and numbers. They are to be interpreted as indicated below:

Character	Description
“A”	Preferred Material – Virtually Unlimited Life. Should be considered as first choice. Where more than one material is rated "A", user should select based on own personal experience or knowledge.
“B”	Satisfactory Material – Reasonable Life under Most Conditions. Considered if an "A" rated option is not available.
“C”	Occasionally Used – Some Wear or Corrosion Expected. Life expectancy varies as a function of temperature, concentration, and/or velocity. Use with Caution.
“X”	Not Recommended. This material definitely can be troublesome, will not survive, or is unacceptable.
“–”	Sufficient information not available.
(%)	Percent concentration of process liquid.
(°C)	Maximum recommended process temperature in °C.

1. For 9200A models, the ptfe maximum temperature is 100°C (212°F).

Table 1. Flowtube Lining Material and Line Size Availability – Selection Guide

Flowtube Series	Wetted Lining Material	Wetted Gasket Material	Available Sizes	
			mm	in
2800 (a)	pfa	–	2.5 to 6	1/10 to 1/4
2800/8300[a]	ptfe	–	15 to 600	1/2 to 24
2800/8300[a]	Polyurethane	–	50 to 900	2 to 36
2800/8300[a]	Neoprene	–	350 to 900	14 to 36
2800/8300[a]	Sanitary (ptfe)	–	15 to 80	1/2 to 3
9100A	Ebonite	–	25 to 2000	1 to 78
9200A	Neoprene, EPDM, Linatex, Ebonite, or ptfe	–	15 to 2000	1/2 to 78
9300A[a]	pfa	–	15 to 300	1/2 to 12
9300A[a] (b)	ptfe	–	15 to 400	1/2 to 16
9300A[a]	Polyurethane	–	200 to 400	8 to 16
8000A-WP[a]	pfa	–	15 to 150	1/2 to 6
8000A-WC[a]	Ceramic	Gylon 3510	1.6 to 150	1/16 to 6
8000A-SC[a]	Ceramic (Sanitary)	Buna-N or Viton	15 to 80	1/2 to 3
4700S	Ceramic, pfa	EPDM, NBR	10 to 100	1/2 to 4
MAG21C	pfa	–	2.5 to 200	1/10 to 8
MAG2RS	pfa	–	10 to 200	3/8 to 8

a. These flowtubes are PED qualified in EU applications for SEP (Standard Engineering Practices) CATEGORY I with Group 2 fluids (nonhazardous).

b. Consult Global Customer Support for availability of 930HA.

Table 2. Process Fluid Characteristics versus Flowtube Construction – Selection Guide

Flowtube Construction	Fluid Characteristics (a)						
	Clean	Mild Corrosion	Severe Corrosion	Mild Abrasion	Severe Abrasion (b)	Mild Corrosion and Abrasion	Sanitary
ptfe/pfa (2800)	A	A	A	B	X	B	A (c)
pfa (8000A/9300A)	A	A	A	B	X	B	A (d)
Sanitary (ptfe)	A	A	A	B	X	B	A (e)
Polyurethane	A	B	X	A	A	B	X
Neoprene	A	A	X	A	B	A	X
Ceramic	A	A	A	A	B	A	A[c]
Ceramic (Sanitary)	A	A	A	A	B	A	A[e]
EPDM	A	A	B	A	B	A	

Table 2. Process Fluid Characteristics versus Flowtube Construction – Selection Guide (Continued)

Flowtube Construction	Fluid Characteristics (a)						
	Clean	Mild Corrosion	Severe Corrosion	Mild Abrasion	Severe Abrasion (b)	Mild Corrosion and Abrasion	Sanitary
Linatex	A	B	X	A	A	B	
Ebonite	A	A	B	A	B	B	

a. A = Preferred: Generally considered best choices.
B = Satisfactory: Reasonable life under most conditions.
X = Not Recommended: Generally considered unsuitable.

b. Severe abrasion rating also includes/considers effects on electrode.

c. Ceramic and ptfe meet sanitary requirements of FDA.

d. pfa meets sanitary requirements of FDA.

e. Meets sanitary requirements of 3-A and FDA.

Table 3. Process Wetted Material versus Process Liquid – Selection Guide

Process Liquid	Chemical Formula	Flowtube Lining Material (a)							Electrode Material[(a)]						
		ptfe /pfa	Poly	Neo	Natural Rubber (Linatex)	EPDM	Hard Rubber(b) (Ebonite)	Cer	Plat	Tant	316 ss	Hast C	Titan	Zr	Ni
Acetaldehyde	CH_3CHO	A	X	X	X	–	C	A	A	A	A	A	A	A	A
Acetic Acid (30%)	CH_3COOH	A	X	B	X	B	B	A	A	A	A	A	A	A	B
Acetone & Water	CH_3COCH_3	A	X	B	X	–	B	A	A	A	A	A	A	A	A
Alum (10%)	$K_2Al_2(SO_4)_4$	A	–	B	–	A	A	A	A	A	B	B	A	A	B
Alumia	Al_2O_3	A	–	–	–	–	–	A	–	A	B	A	A	A	B
Aluminum Chloride (20%)	$AlCl_3$	A	–	A	A(20) (c)	A	C	A	A	A	X	A	X	A	A
Aluminum Chlorohydrate	$Al_nCl_{(3n-m)}(OH)_m$	A	–	–	–	–	–	A	A	A	X	B	X	A	A
Aluminum Fluoride	AlF_3	A	–	B	B	A	A	B	A	X	X	B	X	X	B
Aluminum Hydroxide (20%)	$Al(OH)_3$	A	–	–	–	A	–	A	A	B	B	B	A	A	B
Aluminum Nitrate	$Al(NO_3)_3$	A	–	A	B	A	–	A	A	A	B	B	A	–	–
Aluminum Sulfate (<100°C)	$Al_2(SO_4)_3$	A	B	A	A	A	A	A	A	A	A	A	A	A	B
Ammonium Bicarbonate	NH_4HCO_3	A	–	–	–	–	–	A	A	A	B	B	A	–	A
Ammonium Bisulfate	NH_4HSO_4	A	–	A	–	–	–	A	A	A	X	X	A	–	–
Ammonium Carbonate	$(NH_4)_2CO_3$	A	–	A	A	A	A	A	A	A	B	B	–	–	A
Ammonium Chloride (<50%)	NH_4Cl	A	A	A	A	A	A	A	A	A	X	C	A	A	A
Ammonium Fluoride (20%)	NH_4F	A	–	–	A	A	A	B	A	X	X	B	X	X	A
Ammonium Hydroxide (<30%)	NH_4OH	A	A	A	X	A	A	A	A	X	B	B	A	A	X
Ammonium Nitrate	NH_4NO_3	A	B	A	A	A	A	A	A	A	B	B	X	A	B
Ammonium Persulfate	$(NH_4)_2S_2O_8$	A	X	B	–	–	–	A	A	A	B	B	–	A	X
Ammonium Phosphate (20%)	$(NH_4)_3PO_4$	A	–	B	A	A	–	A	A	A	B	B	A	A	B
Ammonium Sulfate (<70°C)	$(NH_4)_2SO_4$	A	A	A	A	A	B	A	A	A	X	B	–	A	A
Barium Acetate	$Ba(C_2H_3O_2)_2$	A	X	X	–	–	–	A	A	A	X	X	–	–	–
Barium Carbonate	$BaCO_3$	A	–	–	A	A	–	A	A	A	C	B	A	A	A
Barium Chloride	$BaCl_2$	A	A	A	B	A	A	A	A	A	X	B	B	A	B
Barium Hydroxide (<70°C)	$Ba(OH)_2$	A	A	A	A	A	A	B	A	X	B	B	–	A	B

Table 3. Process Wetted Material versus Process Liquid – Selection Guide (Continued)

Process Liquid	Chemical Formula	Flowtube Lining Material (a)							Electrode Material[a]						
		ptfe /pfa	Poly	Neo	Natural Rubber (Linatex)	EPDM	Hard Rubber(b) (Ebonite)	Cer	Plat	Tant	316 ss	Hast C	Titan	Zr	Ni
Barium Sulfate	$BaSO_4$	A	A	A	A	A	–	A	A	A	B	B	–	A	A
Barium Sulfide	BaS	A	A	B	A	B	–	A	A	A	X	–	A	B	A
Beer		A	A	A	C	A	A	A	A	A	A	A	A	–	A
Black Liquor		A	X	X	C	B	–	B	A	X	B	A	B	–	X
Borax Solution	$Na_2B_4O_7{\cdot}10H_2O$	A	A	B	A	A	–	A	A	A	A	A	A	–	A
Boric Acid	H_3BO_3	A	A	A	A	A	A	A	A	A	B	A	A	A	A
Brine	$Na^+_{(aq)}Cl^-_{(aq)}$	A	B	A	–	–	A	A	A	A	X	A	A	–	–
Calcium Bisulfite	$Ca(HSO_3)_2$	A	A	A	C	A(20)[c]	C	A	A	A	B	B	A	B	X
Calcium Carbonate	$CaCO_3$	A	–	–	A	A	–	A	A	A	B	B	A	A	A
Calcium Chlorate (dil.)	$CaCl_2O_6$	A	–	–	–	–	–	A	A	A	X	A	A	–	A
Calcium Chloride	$CaCl_2$	A	A	A	–	A	–	A	A	A	X	A	A	A	B
Calcium Hydroxide (25%)	$Ca(OH)_2$	A	A	A	A(20)[c]	A	A	A	A	A	X	A	A	A	A
Calcium Hypochlorite (<70°C)	$Ca(ClO)_2$	A	X	B	X	A	–	A	A	A	X	B	A	B	X
Calcium Nitrate	$Ca(NO_3)_2$	A	A	A	B	A	A	A	A	A	B	B	A	–	B
Calcium Sulfate	$CaSO_4$	A	–	–	B	A	A	A	A	A	B	B	A	A	A
Caustic-See Sodium Hydroxide		–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cheese		A	X	X	–	–	X	A	A	A	A	A	A	–	–
Chloroacetic Acid (100%)	$CClH_2COOH$	A	X	–	X	–	A	A	A	A	X	B	A	A	B
Chlorine Dioxide	ClO_2	B	X	X	–	–	–	B	X	B	X	B	B	–	–
Chromic Acid (50%)	CrO_3	A	X	X	X	C	A	A	A	A	X	B	B	A	X
Chromium Sulfate (50%)	$Cr_2(SO_4)_3$ - xH_2O	A	X	X	–	–	–	A	A	A	B	B	–	–	–
Clay Slurry		B	B	A	–	–	–	A	A	A	A	A	A	–	–
Coal & Water Slurry		C	A	A	–	–	–	A	A	A	B	A	A	–	–
Copper Chloride	$CuCl_2$	A	A	A	A(20)[c]	A	B	A	X	A	X	B	A	X	X
Copper Cyanide	CuCN	A	A	A	A	A	–	A	A	A	B	B	A	X	X
Copper Fluoride	CuF_2	A	–	–	A(50)[c]	A(50)[c]	–	B	A	X	X	X	–	–	–
Copper Nitrate	$Cu(NO_3)_2$	A	–	–	A	A	–	A	A	A	B	X	A	X	X
Copper Sulfate	$CuSO_4$	A	A	A	B	A	A	A	A	A	B	A	B	B	X
Dairy Products		A	X	X	–	–	–	A	A	A	A	A	A	–	–
Dyes		A	–	–	–	–	–	A	A	A	A	A	A	–	–
Ferric Chloride (50%)	$FeCl_3$	A	B	B	A	A	A	A	X	A	X	X	A	X	X
Ferric Nitrate (5%)	$Fe(NO_3)_3$	A	–	B	–	A	A	A	A	A	X	B	A	–	X
Ferric Sulfate	$Fe(SO_4)_3$	A	–	A	C	A	B	A	A	A	X	B	A	A	X
Ferrous Chloride (10%)	$FeCl_2$	A	B	B	C	–	–	A	A	A	X	B	A	A	X
Ferrous Nitrate	$Fe(NO_3)_2$	A	–	–	–	B	–	A	A	A	X	B	A	–	–
Ferrous Sulfate (10%)	$(FeSO_4)$	A	X	B	–	A	A	A	A	A	X	B	A	A	A
Fluosilicic Acid (40%)	H_2SiF_6	A	X	B	C	C	–	B	A	X	X	X	X	X	–
Formaldehyde (40%)	CH_2O	A	X	C	B	C	C	A	A	A	A	B	A	A	A
Formic Acid (50%, <40°C)	H-COOH	A	X	A	X	A	B	A	A	A	X	A	X	A	A
Green Liquor		A	X	X	–	–	–	A	A	X	B	A	A	–	B
Hydrobromic Acid (50%)	HBr	A	X	–	–	B	–	A	A	A	X	X	A	X	X
Hydrochloric Acid (38%, <60°C)	HCl	A	X	X	A(20)[c]	C	A	C	B	A	X	X	X	A	X
Hydrocyanic Acid (10%)	HCN	A	X	X	C	A	C	A	A	A	X	B	B	–	–
Hydrofluoric Acid (20%, <40°C)	HF	A	X	X	–	X	X	C	A	X	X	X	X	X	B
Hydrofluosilicic (35%)	H_2SiF_6	A	–	C	–	–	–	B	A	X	X	B	X	X	B

Table 3. Process Wetted Material versus Process Liquid – Selection Guide (Continued)

Process Liquid	Chemical Formula	Flowtube Lining Material (a)							Electrode Material[a]						
		ptfe /pfa	Poly	Neo	Natural Rubber (Linatex)	EPDM	Hard Rubber(b) (Ebonite)	Cer	Plat	Tant	316 ss	Hast C	Titan	Zr	Ni
Hydrogen Peroxide (50%)	H_2O_2	A	X	B	X	C	C	A	A	A	B	A	B	A	–
Hypochlorous Acid (20%)	HClO	A	–	–	C	–	–	A	A	A	X	X	A	–	X
Latex		A	X	X	–	–	–	A	A	A	A	A	A	–	–
Lead Acetate	$Pb(C_2H_3O_2)_2$	A	X	C	B	A	–	A	A	A	B	B	B	–	A
Limestone Slurry		A	A	A	–	–	A	A	A	A	A	A	A	–	–
Lithium Chloride (50%)	LiCl	A	–	–	A(20)[c]	B	–	A	A	A	X	A	A	–	A
Magnesium Carbonate	$MgCO_3$	A	–	–	–	B	–	A	A	A	B	B	A	A	B
Magnesium Chloride (5%)	$MgCl_2$	A	B	B	–	A	A	A	A	A	B	A	A	A	A
Magnesium Hydroxide	$Mg(OH)_2$	A	B	B	B	–	–	A	A	A	B	B	A	–	A
Magnesium Nitrate	$Mg(NO_3)_2$	A	–	–	B	–	–	A	A	A	B	B	B	–	–
Magnesium Sulfate	$MgSO_4$	A	–	A	B	A	A	A	A	A	A	A	A	A	A
Mercuric Chloride (50%)	$HgCl_2$	A	–	B	A	A	–	A	A	A	X	X	A	A	B
Milk		A	X	X	B(20)[c]	B	A	A	A	A	A	A	A	–	A
Molasses		A	X	X	B	C	A	A	A	A	A	A	A	–	A
Nickel Chloride	$NiCl_2$	A	–	B	A	A	–	A	A	A	X	B	A	A	A
Nickel Nitrate	$Ni(NO_3)_2$	A	–	–	A	A	–	A	A	A	B	B	B	–	A
Nickel Sulfate	$NiSO_4$	A	A	A	A	A	–	A	A	A	B	B	B	A	A
Nitric Acid (40%, <60°C)	HNO_3	A	X	X	X	C	A	B	A	A	A	X	A	A	X
Nitric Acid (70%, <40°C)	HNO_3	A	X	X	X	X	X	C	A	A	B	X	X	A	X
Oleum	$H_2SO_4 \cdot xSO_3$	A	X	X	X	X	X	A	A	X	C	B	X	–	–
Paper Stock		A	X	X	–	–	–	A	A	A	A	A	A	–	–
Phosphate Slurry		A	A	–	–	–	–	A	A	A	C	A	A	–	–
Phosphoric Acid (25%, <60°C)	H_3PO_4	A	B	B	B	B	C	B	A	A	A	A	X	A	X
Phosphoric Acid (85%, <60°C)	H_3PO_4	A	B	B	–	B	B	X	A	A	X	B	X	A	X
Potassium Aluminum Sulfate	$AlK(SO_4)_2$	A	X	B	–	–	–	A	A	A	B	B	A	A	–
Potassium Bicarbonate	$KHCO_3$	A	–	–	–	B	–	A	A	A	B	B	–	A	A
Potassium Carbonate	K_2CO_3	A	–	–	A	B	A	B	A	X	B	A	A	B	B
Potassium Chloride	KCl	A	X	A	A	A	A	A	A	A	X	A	A	A	A
Potassium Dichromate	$K_2Cr_2O_7$	A	B	A	X	A(20)[c]	–	A	A	X	B	B	A	A	A
Potassium Hydroxide (<50%,40°C)	KOH	A	B	B	C	A	X	B	A	X	B	B	X	A	A
Potassium Nitrate	KNO_3	A	X	A	A	A	A	A	A	A	B	B	A	A	A
Potassium Permanganate	$KMnO_4$	A	–	–	C	A	C	A	A	A	B	B	B	–	A
Potassium Persulfate (10%)	$K_2S_2O_8$	A	–	–	C	B	–	A	A	A	A	B	A	–	–
Potassium Sulfate	K_2SO_4	A	X	A	B	A	B	A	A	A	B	B	A	–	A
Sewage, Raw		A	A	B	–	B	–	A	A	A	A	A	A	–	–
Sea Water		A	C	A	A	A	A	A	A	A	X	A	A	A	B
Silver Nitrate	$AgNO_3$	A	–	–	A	A	–	–	A	A	B	C	A	A	X
Sludge, Activated		A	A	A	–	–	–	A	A	A	A	A	A	–	–
Sludge, Primary		A	A	A	–	–	–	A	A	A	A	A	A	–	–
Sludge, Thickened		A	A	A	–	–	–	A	A	A	A	A	A	–	–
Sludge, Waste		A	A	A	C	–	–	A	A	A	A	A	A	–	–
Sodium Acetate	CH_3COONa	A	X	C	–	B	–	A	A	A	B	A	A	A	A
Sodium Bicarbonate	$NaHCO_3$	A	–	A	A	A	A	A	A	A	B	B	A	A	A
Sodium Bisulfate	$NaHSO_4$	A	–	–	A	A	–	A	A	A	X	C	A	A	A
Sodium Bisulfite (40%, 40°C)	$NaHSO_3$	A	–	A	A	A	A	A	A	A	B	B	B	–	B

Table 3. Process Wetted Material versus Process Liquid – Selection Guide (Continued)

Process Liquid	Chemical Formula	Flowtube Lining Material (a)							Electrode Material[a]						
		ptfe /pfa	Poly	Neo	Natural Rubber (Linatex)	EPDM	Hard Rubber(b) (Ebonite)	Cer	Plat	Tant	316 ss	Hast C	Titan	Zr	Ni
Sodium Borate (Borax)	$Na_2B_4O_7{\cdot}10H_2O$	A	–	B	–	–	–	A	A	A	B	A	A	–	A
Sodium Carbonate (<20%)	Na_2CO_3	A	–	–	A	–	A	A	A	B	A	A	A	A	A
Sodium Chlorate	$NaClO_3$	A	–	–	C	A(20)[c]	A	A	A	A	C	B	A	B	A
Sodium Chloride	NaCl	A	A	B	A(20)[c]	A	A	A	A	A	X	A	A	A	A
Sodium Chlorite (10%, 38°C)	$NaClO_2$	A	–	–	–	–	X	A	B	A	X	B	A	–	–
Sodium Cyanide	NaCN	A	–	B	A	–	–	A	A	A	X	B	A	–	X
Sodium Hydroxide (5%, <50°C)	NaOH	A	X	X	–	A	A	A	A	X	A	A	A	A	A
Sodium Hydroxide (25%, <40°C)	NaOH	A	X	X	–	–	A	B	A	X	B	A	A	A	A
Sodium Hydroxide (50%, <40°C)	NaOH	A	X	X	A(20)[c]	–	A	C	A	X	B	B	B	A	A
Sodium Hypochlorite (<20%)	NaOCl	A	X	B	X	A(20)[c]	X	A	A	A	X	B	A	B	X
Sodium Nitrate	$NaNO_3$	A	–	X	A	A	A	A	A	A	A	B	A	B	A
Sodium Nitrite	$NaNO_2$	A	–	–	A	A(60)[c]	A	A	A	A	A	B	A	A	A
Sodium Silicate	Na_2SiO_3	A	–	X	A	A	A	A	A	A	A	B	A	A	A
Sodium Sulfate	Na_2SO_4	A	C	A	A	B	–	A	A	A	B	B	B	A	A
Sodium Sulfide (20%, 50°C)	Na_2S	A	–	X	–	A	–	A	A	B	B	B	–	X	B
Sodium Sulfite (<20%, 50°C)	Na_2SO_3	A	–	X	–	B	–	A	A	A	A	B	A	A	A
Sodium Thiosulfate	$Na_2S_2O_3$	A	X	X	A	A	–	A	–	A	A	A	A	–	B
Sulfuric Acid (10%, <65°C)	H_2SO_4	A	X	B	B	A	A	B	A	A	X	C	X	A	B
Sulfuric Acid (25%, <60°C)	H_2SO_4	A	X	C	B	A	A	C	A	A	X	C	X	A	B
Sulfuric Acid (50%, <60°C)	H_2SO_4	A	X	X	X	–	A	X	A	A	X	X	X	A	B
Sulfuric Acid (98%, <60°C)	H_2SO_4	A	X	X	X	–	A	B	A	A	X	X	X	X	X
Sulfurous Acid (10%)	H_2SO_3	A	X	C	–	–	B	A	A	A	C	B	A	B	X
Titanium Dioxide	TiO_2	A	B	B	–	–	–	A	A	A	A	A	A	–	–
Trisodium Phosphate	Na_3PO_4	A	B	B	A	A(20)[c]	–	A	A	A	B	B	–	A	B
Urea (50%)	$(NH_2)_2CO$	A	X	X	A	A	A	A	–	A	B	–	A	A	B
Water, Potable	H_2O	A	C	B	–	A	A	A	A	A	A	A	A	–	–
Water, River/City	H_2O	A	A	A	–	A	A	A	A	A	A	A	A	–	–
White Liquor		A	–	B	X	C	–	B	A	X	B	B	B	A	–
Zinc Chloride (<20%, 50°C)	$ZnCl_2$	A	B	A	–	A	B	B	A	B	X	B	A	A	A
Zinc Sulfate	$ZnSO_4$	A	X	A	B	B	–	B	A	A	B	B	A	B	A

a. A = Preferred: Generally considered best choices.
B = Satisfactory: Reasonable life under most conditions.
X = Not Recommended: Generally considered unsuitable.
b. Process liquid at 20°C.
c. Rated at temperature in °C shown.

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