



TECHNICAL SUMMARY

The following two tables, "Materials Compatibility" and "Plastics and Other Non-Metals Compatibility" show materials of construction and whether or not they may be used with solutions of RemOx® S ISCO reagent (potassium permanganate). In using the information provided in this chart, it should be understood that some of the data was gathered from in-plant and field experiences of engineers and plant operators using permanganate solutions. Over half of the data is from laboratory experiments only. The manufacturer's literature was also consulted in the preparation of the charts. In each case, the results are specific to the conditions under which the permanganate was being applied. Use these tables as a guide, but not as a guarantee.

MATERIALS COMPATIBILITY

Potassium permanganate compatibility with metal products will depend upon the solution pH, and for some metals, on the solution temperature. When adjusting the solution pH, always be certain that the metal is also compatible with the acid or alkali being used.

	SOLUTION pH				SOLUTION pH		
	Acidic	Neutral	Basic		Acidic	Neutral	Basic
Ferrous Metals				Metal Alloys			
Carbon Steel	NO	YES	YES	Brass	NO	YES	YES
Black Iron	NO	YES	YES	Bronze	NO	YES	YES
Galvanized Steel	NO	NO	NO	Hastalloy			
Stainless Steel ¹				B & D	NO	NO	NO
304	YES	YES	YES	C	*	YES	YES
316	YES ²	YES	YES	Incoloy			
420	YES ²	YES	YES	800	*	YES	YES
12% Cr	*	YES ³	YES ³	825	*	YES	YES
17% Cr	*	YES ³	YES ³	840	*	YES	YES ⁸
Carpenter 20	YES	YES	YES	Monel ⁷			
				400	*	YES	YES
Non-Ferrous Metals							
Aluminum	NO	YES ⁴	NO ⁵				
Copper	NO	YES ⁴	NO ⁵				
Lead	NO	YES ⁴	NO ⁵				
Nickel	YES	YES	YES				
Tantalum	*	*	*				
Tin ⁶	YES	YES	YES				
Titanium	*	YES	YES				
Zinc	NO	NO	NO				
Zirconium ⁹	YES	YES	YES				

*information not available

SPECIAL NOTES FOR METALS

1. Stainless steels have a high corrosion rate when chlorides are present in permanganate solutions. They are not compatible with hydrochloric acid.
2. An accelerated corrosion rate was found when nitric acid was used to acidify permanganate solutions.
3. Compatible at room temperature only.
4. Only "FAIR" or "MODERATE" life when used with permanganate solutions. Short-term use would be acceptable.
5. Unsuitable with alkali, such as sodium hydroxide or potassium hydroxide. Should not be used with alkaline permanganate solutions.
6. "FAIR" with permanganate solutions.
7. "MODERATE" life below 100 °F/ 37 °C.
8. Incoloy 840 failed when used as the "sheath" material for an immersion heater in a 2% to 4% permanganate solution.
9. Tested at pH 3, 7, and 9.

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rev. 04/13
form RX 1030





PLASTICS AND OTHER NON-METALS

Permanganate solutions can affect the strength, flexibility, surface appearance, or color of plastics. The chemical attack that could cause these changes might include: (1) oxidation of the polymer chain, (2) oxidation of the functional groups in or on the chain, or (3) depolymerization.

Fibers

Acetates	YES
Acrylis	YES
Cotton	NO
Nylon (polyamides)	NO
Orlon	NO
Paper	NO
Polyesters	YES ¹
Silk	NO
Wool	NO

Tank, Tank Linings, Pump, and other

Equipment Construction Materials

ABS Plastic	YES
Asphaltic Resin	NO
Ceramic	YES
Epoxy Resin	YES ¹
Furan Resin	YES ¹
Glass	YES
Lucite (acrylic resin)	YES
Phenol-formaldehyde Resin	NO
Phenolic Resin	YES ¹
Styrene Copolymers	YES ¹
Polyallomer	YES
Polybutylene	YES
Polycarbonate	NO
Polyethylene	YES ²
Polypropylene	YES ³
Polystyrene	NO
Polysulfone	YES
Polyurethane	YES
Polyvinyl Chloride I	YES ⁴
Polyvinyl Chloride II	NO

Hose, Tubing, Pipe, and Gasket Materials

Asbestos	NO
Chlorinated Polyvinyl Chloride (CPVC)	YES ³
Ethylene Propylene Rubber (EPR)	NO
Ethylene Propylene Terpolymers (EPT)	YES ⁵
Ethylene Propylene Diene Monomer (EPDM)	YES
Hycar	NO
Hypalon	YES
Natural Rubber	NO
Nitrobutyl Rubber	NO
Nitrile Butadiene Rubber (NBR)	NO ⁶
Neoprene	NO
Norprene	YES
Penton	YES
Polyphenylene Oxides (PPO)	YES
Polyvinylidene Chloride (Tygon)	YES
Polyvinylidene Fluoride (PVDF)	YES ⁷
Styrene Butadiene Rubber (SBR)	
Buna N	NO
Buna S	NO
Teflon FEP	YES ⁷
Teflon TFE	YES
Viton	YES ⁵

Oils, Greases, and Lubricants

All oils, greases, and lubricants must be tested for compatibility with potassium permanganate.

When unknown, assume that potassium permanganate will react with these compounds resulting in fire and/or explosion.

SPECIAL NOTES FOR PLASTICS AND OTHER NON-METALS

1. Temperatures up to 200 °F/ 93 °C.
2. Discolored at 140 °F/ 60 °C.
3. Temperatures of 68 - 176 °F/ 20-80 °C.
4. Temperatures up to 140 °F/ 60 °C.
5. Temperatures of 68 - 140 °F/ 20-60 °C.
6. Temperatures to 68 °F/ 20 °C.
7. Temperatures of 68 - 248 °F/ 20-120 °C.