**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

**Ferrous Metals**

<table>
<thead>
<tr>
<th>Metal</th>
<th>Acidic</th>
<th>Neutral</th>
<th>Basic</th>
<th>Acidic</th>
<th>Neutral</th>
<th>Basic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Steel</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>Brass</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Black Iron</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>Bronze</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Galvanized Steel</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>Hastalloy</td>
<td>B &amp; D</td>
<td>NO</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>304</td>
<td>YES</td>
<td>YES</td>
<td>C</td>
<td>*</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td>316</td>
<td>YES²</td>
<td>YES</td>
<td></td>
<td>*</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td>420</td>
<td>YES³</td>
<td>YES</td>
<td></td>
<td>*</td>
<td>YES</td>
</tr>
<tr>
<td>12% Cr</td>
<td>*</td>
<td>YES³</td>
<td>YES³</td>
<td></td>
<td>*</td>
<td>YES</td>
</tr>
<tr>
<td>17% Cr</td>
<td>*</td>
<td>YES³</td>
<td>YES³</td>
<td></td>
<td>*</td>
<td>YES³</td>
</tr>
<tr>
<td>Carpenter 20</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td></td>
<td>*</td>
<td>YES</td>
</tr>
</tbody>
</table>

**Non-Ferrous Metals**

<table>
<thead>
<tr>
<th>Metal</th>
<th>Acidic</th>
<th>Neutral</th>
<th>Basic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>NO</td>
<td>YES⁴</td>
<td>NO⁵</td>
</tr>
<tr>
<td>Copper</td>
<td>NO</td>
<td>YES⁴</td>
<td>NO⁵</td>
</tr>
<tr>
<td>Lead</td>
<td>NO</td>
<td>YES⁴</td>
<td>NO⁵</td>
</tr>
<tr>
<td>Nickel</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Tantalum</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Tin⁶</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Titanium</td>
<td>*</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Zinc</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Zirconium⁹</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>

**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.
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
- Acrylic: YES
- Cotton: NO
- Nylon (polyamides): NO
- Orlon: NO
- Paper: NO
- Polyessters: YES
- Silk: NO
- Wool: NO

**Hose, Tubing, Pipe, and Gasket Materials**
- Asbestos: NO
- Ethylene Propylene Rubber (EPR): NO
- Ethylene Propylene Terpolymers (EPT): YES
- Ethylene Propylene Diene Monomer (EPDM): YES
- Hyac: NO
- Hypalon: YES
- Natural Rubber: NO
- Nitrobutyl Rubber: NO
- Nitrile Butadiene Rubber (NBR): NO
- Neoprene: NO
- Noryl: YES
- Penton: YES
- Polyphenylene Oxides (PPO): YES
- Polyvinylidene Chloride (Tygon): YES
- Polyvinylidene Fluoride (PVDF): YES
- Styrene Butadiene Rubber (SBR): YES
- Buna N: NO
- Buna S: NO
- Teflon FEP: YES
- Teflon TFE: YES
- Viton: YES

**Tank, Tank Linings, Pump, and other Equipment Construction Materials**
- ABS Plastic: YES
- Asphaltic Resin: NO
- Ceramic: YES
- Epoxy Resin: YES
- Furan Resin: YES
- Glass: YES
- Lucite (acrylic resin): YES
- Phenol-formaldehyde Resin: NO
- Phenolic Resin: YES
- Styrene Copolymers: YES
- Polyallomer: YES
- Polybutylene: YES
- Polycarbonate: YES
- Polyethylene: YES
- Polyisobutylene: YES
- Polysulfone: YES
- Polurethane: YES
- Polyvinyl Chloride I: YES
- Polyvinyl Chloride II: NO

**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 of 68-20 °C.
7. Temperatures of 68-248 °F/ 20-120 °C.
8. Temperatures of 68-140 °F/ 20-60 °C.

**Hose, Tubing, Pipe, and Gasket Materials**
- Asbestos: NO
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- Styrene Butadiene Rubber (SBR): YES
- Buna N: NO
- Buna S: NO
- Teflon FEP: YES
- Teflon TFE: YES
- Viton: YES

**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.