CORROSION R E S J S T A N C E OF METALS IN VARIOUS CHEMICAL MEDIA

Titanium Zirconium Niobium Tantalum



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SOPROJECT MANAGEMENT

TITAN's unique project management system gives the responsibility for the sales estimate, design and engineering management, procurement and supervision of the actual manufacturing process to one person. The system fosters an intimate knowledge of each project's design, quality and delivery requirements, ensuring that it meets the expectations of each individual customer.

SALES ENGINEERING

Our experienced sales engineers give their full attention to customers' processes and applications. Concentrating on the way design details reflect customers' needs is a crucial element in the success of any project. TITAN utilizes custom designed estimating software to quickly prepare accurate cost estimates and custom proposals to meet your project needs.

ENGINEERING AND DESIGN

As one of the world leaders in the design and fabrication of corrosion resistant heat transfer equipment for use in extremely hostile process environments, TITAN utilizes state-of-the-art computer software to thermally, mechanically and graphically design its heat exchangers to the applicable ASME, PED or TEMA standards.

MANUFACTURING

Extensive industry experience allows TITAN to pay particular attention to the specific details involved in the manufacture of reactive metal equipment. Knowing how to machine, form and weld tantalum, niobium, zirconium and titanium is imperative. Our comprehensive knowledge of manufacturing preparations and procedures allows TITAN to fabricate reactive metal equipment in the most efficient way possible.

METAL FINISHING

Founded in 1998 by industry experts with decades of experience in the design and fabrication of corrosion resistant equipment, **TITAN is dedicated and uniquely** qualified to give you the confidence and peace of mind that you made the right decision.

QUALITY ASSURANCE

TITAN pays particular attention to quality. In addition to our own stringent inspection process, we use AWS, ASTM, ASME, PED and TEMA standards as fabrication guidelines, allowing the equipment we manufacture to meet or exceed our customers' highest expectations. We encourage customers to personally inspect our workmanship at our plant during the fabrication process.

RESEARCH AND DEVELOPMENT

Whether it's an innovative new welding process to increase quality while decreasing fabrication time, or extensive testing to find the material that best suits your particular application, TITAN is constantly striving to produce the most rugged, cost-effective equipment possible. We have the dedication, expertise, flexibility and resources to develop whatever technology is necessary to increase quality and reduce costs for our customers.



Corrosion Resistance of Metals in Various Chemical Media

The information enclosed in this must be used as a general suggestion and not as a guarantee. The final selection of a material must be based on the actual evaluation of the metal in the corrosive medium under study.

| | | Legend | | | | | | | | | |
|---|---------------|-------------------|----------|---------|-----------|----------|---------|---------|---------|---------|--------|
| A Fully Resistant | | * | 5 | Subje | ct to | pitting | g at a | ir line | e or w | hen | |
| B Slightly Resistant | | | a | allowe | ed to | dry | - | | | | |
| C Unsatisfactory | | + | ľ | May a | attack | whe | n suli | uric a | acid is | s pres | ent |
| | | | | | | | | | | | |
| | | Salts | | | | | • | | | | |
| Chemical | Concentration | Temperature °F | Tantalum | Niobium | Zirconium | Titanium | Alloy B | Alloy C | Monel | Inconel | 316 SS |
| Acetyl Chloride | | Cold & Boiling | | | | | | | AB | | В |
| Aluminum Acetate | Saturated | g | Α | | | | A | Α | AB | AB | В |
| Aluminum Chloride | 5% | Room | Α | Α | Α | Α | Α | Α | AB | | С |
| Aluminum Fluoride | 5% | Room | С | С | С | С | Α | Α | AB | | В |
| Aluminum Hydroxide | Saturated | | Α | | | | | | AB | | Α |
| Aluminum Oxalate | | | | | | | Α | Α | AB | | |
| Aluminum Potassium Sulfate | 2% | Room | A | | | | | | AB | | A |
| Aluminum Potassium Sulfate | 10% | Room | A | | | | | A | AB | | A |
| Aluminum Potassium Sulfate | 10% | Boiling | A | | | | | | С | | A |
| Aluminum Potassium Sulfate | Saturated | Boiling | A | | | | | | С | | В |
| Aluminum Sulfate | 10% | Room | Α | | Α | | Α | Α | AB | | Α |
| Aluminum Sulfate | 10% | Boiling | Α | | А | | Α | Α | С | | Α |
| Aluminum Sulfate | Saturated | Room | Α | | | | Α | Α | AB | | Α |
| Aluminum Sulfate | Saturated | Boiling | Α | | | | | | С | | Α |
| Ammonia (Anhydrous Dry) | | | | | | | Α | Α | AB | Α | Α |
| Ammonium Alum | | | А | | | | Α | Α | | AB | Α |
| Ammonium Alum (Slightly Ammonialcal) | | | A | | | | A | A | | AB | A |
| Ammonium Bicarbonate | | Hot | A | | | | | | AB | Α | Α |
| Ammonium Bromide | 5% | Room | A | | | | A | Α | AB | | A |
| Ammonium Carbonate | All Conc. | Hot & Cold | A | | | | A | A | A | A | A |
| Ammonium Chloride | 1% | Room | A | | Α | Α | A | A | A | - | A |
| Ammonium Chloride | 10% | Boiling | Α | | Α | Α | Α | Α | AB | | Α |

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| | | Salts | | | | | | | | | |
|-----------------------|----------------------------------|-------------------|----------|---------|-----------|----------|---------|---------|-------|---------|--------|
| Chemical | Concentration | Temperature °F | Tantalum | Niobium | Zirconium | Titanium | Alloy B | Alloy C | Monel | Inconel | 316 SS |
| Ammonium Chloride | 28% | Boiling | Α | | Α | | Α | Α | AB | | Α |
| Ammonium Chloride | 50% | Boiling | Α | | Α | | | Α | AB | | Α |
| Ammonium Hydroxide | | | | | Α | Α | Α | Α | С | Α | Α |
| Ammonium Monosulfate | | | Α | | | | Α | Α | AB | | Α |
| Ammonium Nitrate | 5% | Room | Α | | | | С | Α | | AB | Α |
| Ammonium Oxalate | 5% | Room | Α | | | | Α | Α | AB | AB | Α |
| Ammonium Persulfate | 5% | Room | Α | | | | С | Α | С | AB | Α |
| Ammonium Phosphate | 5% | Room | Α | | | | Α | Α | AB | AB | Α |
| Ammonium Sulfate | 1% to 5% Agitated, Aerated | Room | A | | A | | A | A | AB | | A |
| Ammonium Sulfate | 10% | Boiling | Α | | | | Α | В | AB | | Α |
| Ammonium Sulfate | Saturated | Boiling | Α | | | | Α | В | AB | | Α |
| Ammonium Sulfite | Saturated | Cold & Boiling | A | | | | | | С | С | A |
| Amyl Acetate | | | Α | | | | Α | Α | AB | AB | |
| Amyl Chloride | | | Α | | | | Α | Α | | | |
| Aniline Hydrochloride | 5% | Room | Α | | Α | | Α | Α | | | С |
| Antimony Trichloride | | Room | Α | | | | | | AB | С | |
| Barium Carbonate | | Room | Α | | | | Α | Α | AB | | Α |
| Barium Chloride | 5% to Sat. | Room | Α | | Α | Α | Α | Α | AB | | А |
| Barium Chloride | Aqueous Sol. | Hot | Α | | Α | | | | AB | | Α |
| Barium Hydrate | | | | | | | Α | Α | AB | AB | А |
| Barium Nitrate | Aqueous Sol. | Hot | Α | | | | | | | AB | Α |
| Barium Sulfate | | Room | Α | | | | | | AB | | А |
| Butyl Acetate | | | Α | | | | Α | Α | AB | | |
| Calcium Carbonate | | Room | Α | | | | Α | Α | Α | Α | А |
| Calcium Chlorate | Dilute | Hot or Cold | Α | | | | | Α | AB | AB | А |
| Calcium Chloride | Dil. Or Conc. | Room | Α | | Α | Α | А | Α | AB | AB | А |
| Calcium Hydroxide | 10% to 20% | Boiling | Α | | | | А | Α | Α | Α | А |
| Calcium Hydroxide | 50% | Boiling | | | | | А | Α | Α | А | В |
| Calcium Hypochlorite | 2% | Room | | | В | Α | С | Α | С | С | А |
| Calcium Sulfate | Saturated | Room | Α | | | | | | AB | | А |
| Carbon Bisulfide | | Room | Α | | | | | | AB | AB | А |
| Carbon Tetrachloride | Pure | Room | Α | | А | А | А | Α | А | А | А |
| Carbon Tetrachloride | 5% to 10% Aqueous Sol. | Room | | | A | A | А | A | A | | В |
| Chlorebenzene(Pure) | Concentrated | Room | | | | | | | Α | | А |

| | | Salts | | | | | | | | | |
|--------------------------|--------------------------|-------------------|----------|---------|-----------|----------|---------|---------|-------|---------|---|
| Chemical | Concentration | Temperature °F | Tantalum | Niobium | Zirconium | Titanium | Alloy B | Alloy C | Monel | Inconel | |
| Copper Acetate | Saturated | Room | Α | | | | Α | Α | | AB | |
| Copper Carbonate | Sat. Sol. | | Α | | | | Α | Α | | AB | |
| Copper Chloride | 1% Agitated & Aerated | Room | A | | | | A | A | С | С | |
| Copper Carbonate | Sat. Sol. | | А | | | | Α | Α | | AB | |
| Copper Chloride | 1% Agitated & Aerated | Room | A | | | | A | A | С | С | |
| Copper Chloride | 5% Agitated | Room | А | | | | Α | Α | С | С | |
| Copper Chloride | 5% Aerated | Room | А | | | | Α | Α | С | С | |
| Copper Cyanide | Saturated | Boiling | Α | | | | Α | Α | С | С | |
| Copper Nitrate | 1% to 5% | Room | Α | | | | С | Α | С | В | |
| Copper Nitrate | 50% Aqueous | Room | Α | | | | С | Α | С | С | |
| Copper Sulfate | 5% | Room | Α | | | А | A | Α | В | В | |
| Copper Sulfate | Saturated | Boiling | Α | | | А | С | Α | С | С | |
| Cupric Chloride | | 105 F | Α | | С | А | С | Α | С | С | |
| Cupric Nitrate | | | А | | | | С | Α | С | С | |
| Ethyl Acetate | | | Α | | | | A | Α | Α | Α | |
| Ethyl Chloride | 5% | Room | Α | | | | Α | Α | AB | | |
| Ethylene Chloride | | Room | Α | | AB | | | | AB | | |
| Ferric Chloride | 1% Still | Room | А | | С | А | С | Α | С | С | |
| Ferric Chloride | 1% Still | Boiling | А | | С | А | С | Α | | | |
| Ferric Chloride | 5% Still | Room | А | | С | А | С | Α | С | С | |
| Ferric Chloride | 5% Agitated | Room | А | | С | А | С | Α | | | |
| Ferric Chloride | 5% Aerated | Room | А | | С | А | С | А | С | С | |
| Ferric Hydroxide | | Room | А | | | | С | А | AB | Α | |
| Ferric Nitrate | 1% to 5% | Room | А | | | | С | Α | С | С | |
| Ferric Sulfate | 1% to 5% | Room | А | | | | С | Α | С | С | |
| Ferrous Chloride | | Room | А | | | | Α | А | С | С | |
| Ferrous Sulfate | Dilute | Room | А | | | | Α | А | С | С | |
| Ferrous Ammonium Citrate | | | Α | | | | Α | Α | | AB | |
| Hydrogen Peroxide | | Room | Α | | Α | А | В | Α | AB | AB | - |
| Hydrogen Peroxide | | Boiling | Α | | | А | В | Α | | | - |
| Hydrogen Sulfide | Dry | Room | А | | | А | В | Α | AB | AB | |
| Hyposulfite Soda(Hypo) | | | Α | | | | | | AB | AB | |
| Lactic Acid Salts | | | А | | | | Α | Α | AB | AB | |
| Lead Acetate | | | Α | | | | Α | Α | AB | | |
| Manganese Carbonate | | | Α | 1 | | | | | AB | AB | |

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| | | Salts | | | | | | | | | |
|-------------------------|----------------------------|--------------------|----------|---------|-----------|----------|---------|---------|-------|---------|--------|
| Chemical | Concentration | Temperature °F | Tantalum | Niobium | Zirconium | Titanium | Alloy B | Alloy C | Monel | Inconel | 316 SS |
| Manganese Chloride | 10% to 50% Aqueous Sol. | Boiling | A | | | A | | | AB | AB | A |
| Magnesium Carbonate | | | Α | | | | А | Α | AB | AB | А |
| Magnesium Chloride | 1% to 5% Still | Room | Α | | Α | А | А | А | AB | AB | А |
| Magnesium Chloride | 1% to 5% Still | Hot | A | | A | A | А | А | AB | AB | В |
| Magnesium Hydroxide | Thick Suspension | Room | A | | | | A | A | A | A | A |
| Magnesium Nitrate | | | Α | | | | С | Α | | AB | Α |
| Magnesium Sulfate | 5% | Hot | Α | | | | Α | Α | Α | Α | Α |
| Methylene Chloride | 40% | Room to Boiling | | | | | А | A | AB | | A |
| Mercuric Bichloride | 0.07% | Room | Α | | | | С | С | | | А |
| Mercuric Chloride | Dilute | Room | Α | | Α | А | С | Α | AB | AB | С |
| Mercuric Cyanide | | | Α | | | | С | Α | | AB | А |
| Mercurous Nitrate | | | Α | | | | С | Α | | | А |
| Nickel Chloride | | Room | Α | | AB | Α | С | Α | AB | | А |
| Nickel Nitrate | 10% | Room | Α | | | | Ab | Α | С | С | А |
| Nickel Sulfate | 10% | Room | Α | | | | А | Α | AB | AB | А |
| Nitrous Oxide | Dry | | Α | | | | С | Α | С | С | А |
| Phosphoric Anhydride | Dry | Room | Α | | | | | | | | А |
| Phosphorous Trichloride | | | Α | | | | С | Α | | | А |
| Potassium Bichromate | Neutral | Room | Α | | | | С | Α | | AB | А |
| Potassium Bromide | 5% | Room | Α | | | | А | Α | AB | | А |
| Potassium Carbonate | 1% | Room | Α | | | | А | А | AB | AB | А |
| Potassium Chlorate | | | Α | | | | С | А | AB | AB | А |
| Potassium Chloride | 1% to 5% | Room | Α | | | Α | А | А | AB | | А |
| Potassium Chloride | 1% to 5% | Boiling | Α | | | | С | А | AB | | А |
| Potassium Cyanide | | | Α | | | | А | А | AB | | А |
| Potassium Dichromate | Neutral | | Α | | | | А | Α | | AB | А |
| Potassium Ferricyanide | 5% | Room | Α | | | | А | А | AB | | А |
| Potassium Ferrocyanide | 5% | Room | А | | | | А | А | А | А | А |
| Potassium Hydrate | | | | | | | А | А | А | Α | А |
| Potassium Hydroxide | 5% | Room | Α | | Α | | А | А | А | А | А |
| Potassium Hydroxide | 27% | Boiling | С | | Α | | А | Α | А | Α | А |
| Potassium Hydroxide | 50% | Boiling | С | | | | А | А | А | А | А |
| Potassium Hypochlorite | | | | | | | С | А | С | С | С |

| | | Salts | | | | | | | | | |
|--------------------------|---------------|-------------------|----------|---------|-----------|----------|---------|---------|---|---------|--------|
| Chemical | Concentration | Temperature °F | Tantalum | Niobium | Zirconium | Titanium | Alloy B | Alloy C | Monel | Inconel | 316 SS |
| Potassium Iodide | | | А | | | | Α | Α | AB | | Α |
| Potassium Nitrate | 5% | Room | А | | | | С | Α | AB | | Α |
| Potassium Oxalate | | | Α | | | | Α | Α | | | A |
| Potassium Permanganate | Neutral | | А | | | | С | Α | AB | AB | A |
| Potassium Sulfate | 1% to 5% | Room | А | | | | Α | Α | AB | | Α |
| Potassium Sulfate | 1% to 5% | Hot | Α | | | | | | AB | | Α |
| Potassium Sulfide (Salt) | | | Α | | | | | | | | A |
| Quinine Bisulfate (Dry) | | | Α | | | | Α | Α | AB | | Α |
| Quinine Sulfate (Dry) | | | Α | | | | Α | Α | AB | | Α |
| Silver Bromide | | | Α | | | | Α | Α | AB | | A |
| Silver Chloride | | | Α | | | | С | Α | | | C |
| Silver Cyanide | | | Α | | | | Α | Α | AB | | Α |
| Silver Nitrate | | | Α | | | | AB | AB | | AB | Α |
| Sodium Acetate (Moist) | 5% | Room | А | | | | Α | Α | AB | | Α |
| Sodium Benzoate | | | Α | | | | Α | Α | AB | | |
| Sodium Bicarbonate | All Conc. | 150 | Α | | | | Α | Α | Α | Α | A |
| Sodium Bichromate | Neutral | | Α | | | | С | Α | | AB | Α |
| Sodium Bisulfate | | | Α | | | | Α | Α | AB | | A |
| Sodium Borate | | | А | | | | Α | Α | AB | | Α |
| Sodium Bromide | 5% | Room | Α | | | | Α | Α | AB | | Α |
| Sodium Carbonate | All Conc. | Room | A | | | Α | A | A | A | Α | A |
| Sodium Chlorate | 25% | | Α | | | A | С | A | | AB | A |
| Sodium Chloride | 5% Still | Room to 150 | Α | | Α | Α | A | Α | Α | | A |
| Sodium Chloride | 20% Aerated | Room | Α | | | A | Α | Α | Α | | Α |
| Sodium Chloride | Saturated | Room | A | | | A | Α | A | A | | A |
| Sodium Chloride | Saturated | Boiling | A | | | A | A | A | A | | A |
| Sodium Citrate | | | A | | | | A | A | | AB | A |
| Sodium Ferricyanide | | | A | | | | A | A | AB | AB | A |
| Sodium Ferrocyanide | | | A | | | | | | | | - |
| Sodium Fluoride | 5% | Room | С | | | | Α | Α | AB | | E |
| Sodium Hydrosulfite | 2,0 | | A | | | | B | A | AB | AB | |
| Sodium Hydroxide | 10% | Room | C | | Α | В | A | A | A | A | A |
| Sodium Hypochlorite | 5% | Room |) | | B | B | C | A | C | C | , A |
| Sodium Hyposulfite | Dilute | Room | А | | | | A | A | AB | AB | , A |
| Sodium Lactate | Diato | 1.00111 | A | | | | A | A | AB | , | , A |
| Sodium Nitrate | All Conc. | Room | A | | | A | C | A | AB | AB | Â |
| Sodium Nitrite | 7.11 00010. | 1.00111 | A | ł | | | | · ^ | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | , , , | A |

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| | | Salts | | | | | | | | | |
|------------------------|---------------|-------------------|----------|---------|-----------|----------|---------|---------|-------|---------|--------|
| Chemical | Concentration | Temperature °F | Tantalum | Niobium | Zirconium | Titanium | Alloy B | Alloy C | Monel | Inconel | 316 SS |
| Sodium Peroxide | | 212 | С | | | | С | Α | AB | AB | Α |
| Sodium Phosphate | 5% | Room | Α | | | А | Α | Α | AB | | А |
| Sodium Silicate | | | Α | | | | Α | Α | AB | | Α |
| Sodium Sulfate | 5% Still | Room | Α | | | | Α | Α | AB | AB | Α |
| Sodium Sulfate | Concentrated | Room | Α | | | | Α | Α | AB | | Α |
| Sodium Sulfide | Saturated | Room | Α | | | | Α | Α | | AB | Α |
| Sodium Sulfite | 5% | Room | Α | | | | С | Α | В | | А |
| Stannic Chloride | 5% | Room | Α | | Α | Α | Α | Α | С | С | С |
| Stannous Chloride | 5% | Room | Α | | | | Α | Α | AB | AB | В |
| Sulfur Chloride | Dry | | Α | | | | Α | Α | AB | | С |
| Sulfur Dioxide | Dry | Room | Α | | | А | С | Α | Α | Α | Α |
| Sulfur Dioxide | Moist | Room | Α | | | А | С | Α | С | С | А |
| Titanium Tetrachloride | | | Α | | | | С | Α | AB | | |
| Zinc Chloride | 5% Still | Room | Α | | Α | А | Α | Α | AB | | В |
| Zinc Chloride | 5% Still | Boiling | А | | Α | А | AB | AB | AB | | В |
| Zinc Sulfate | 5% | Room | Α | | | | Α | Α | AB | AB | А |
| Zinc Sulfate | Saturated | Room | Α | | | | Α | Α | AB | | А |
| Zinc Sulfate | 25% | Boiling | Α | | | | Α | Α | AB | | Α |

The information enclosed in this must be used as a general suggestion and not as a guarantee. The final selection of a material must be based on the actual evaluation of the metal in the corrosive medium under study.

| | | Acids | | | | | | | | | |
|---------------------|-------------------|--------------------|----------|---------|-----------|----------|---------|---------|-------|---------|---|
| Chemical | Concentration | Temperature °F | Tantalum | Niobium | Zirconium | Titanium | Alloy B | Alloy C | Monel | Inconel | |
| Acetic Acid | 5% Unaerated | Room | A | | A | A | A | Α | AB | AB | - |
| Acetic Acid | 20% Unaerated | Room | А | | A | А | A | A | AB | AB | |
| Acetic Acid | 50% Unaerated | Room | A | | A | A | A | A | AB | AB | |
| Acetic Acid | 50% Unaerated | Boiling | А | | A | A | A | A | AB | | |
| Acetic Acid | 100% Unaerated | Room | A | | A | A | A | A | AB | AB | |
| Acetic Acid | 100% Unaerated | Boiling | A | | A | A | A | A | AB | С | |
| Acetic Anhydride | Unaerated | Room | | | Α | Α | Α | Α | | AB | |
| Acetic Anhydride | Unaerated | Boiling | | | Α | Α | Α | Α | В | В | |
| Acetic Vapors | 100% Unaerated | Hot | | | | | A | A | AB | AB | |
| Arsenic Acid | 90% | 225° | | | | | | | | В | Ī |
| Benzoic Acid | 5% | Room | Α | | | | Α | Α | AB | AB | ſ |
| Boric Acid | 5% | Boiling | Α | | | | Α | Α | AB | | T |
| Butyric Acid | 5% | Room | Α | | | | Α | Α | | AB | ſ |
| Carbonic Acid | | | Α | | | | Α | Α | AB | AB | ſ |
| Carbolic Acid, C.P. | | Room | Α | | | Α | Α | Α | | | ſ |
| Chloroacetic Acid | | Room | Α | | Α | Α | Α | Α | AB | AB | ſ |
| Chloric Acid | | Room | | | | | | | | | ſ |
| Chlorosulfonic Acid | 10% | | Α | | | | Α | Α | AB | AB | T |
| Chromic Acid | 5% | Room | Α | Α | | Α | С | Α | | AB | ľ |
| Chromic Acid, C.P. | 10% | Boiling | Α | Α | | Α | С | Α | С | С | T |
| Chromic Acid | 50% | Boiling | Α | Α | | В | С | В | С | С | T |
| Citric Acid | 5% Still | 150° | Α | | Α | Α | Α | Α | AB | AB | ſ |
| Citric Acid | 15% | Room | Α | | Α | Α | Α | Α | AB | AB | ſ |
| Citric Acid | 15% | Boiling | Α | | Α | А | Α | Α | | AB | Γ |
| Citric Acid | Concentrated | Boiling | Α | | AB | Α | Α | Α | | | ſ |
| Fatty Acids | | | А | | | | Α | Α | AB | AB | Γ |
| Formic Acid | 5% Still | Room to 150° | A | | A | | A | A | AB | AB | |
| Gallic Acid | 5% | Room to Boiling | | | | | A | A | | AB | |
| Hydrobromic Acid | | Boiling | А | | | | Α | В | С | С | Γ |
| Hydrochloric Acid | 5% Unaerated | Room | Α | Α | А | В | В | Α | AB | | Γ |
| Hydrochloric Acid | 10% Unaerated | Room | A | | A | В | A | A | В | С | Γ |

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| | | Acids | | | | | | | | | |
|------------------------------|------------------|--------------------|----------|---------|-----------|----------|---------|---------|-------|---------|--------|
| Chemical | Concentration | Temperature °F | Tantalum | Niobium | Zirconium | Titanium | Alloy B | Alloy C | Monel | Inconel | 316 SS |
| Hydrochloric Acid | 20% Unaerated | Room | A | | A | С | A | A | | | С |
| Hydrochloric Acid | All | 100° | Α | | Α | С | Α | Α | | | С |
| Hydrochloric Acid | All | 122° | Α | | Α | С | В | В | | | С |
| Hydrochloric Acid | All | 160° | Α | | Α | С | Α | В | | | С |
| Hydrochloric Acid Fumes | Concentrated | 100°A | Α | | С | С | | | | | С |
| Hydrocyanic Acid | | | Α | | | | Α | Α | AB | | Α |
| Hydroflouric Acid | All | All | С | С | С | С | Α | Α | AB | | С |
| Hydrofluoric Acid Vapor | | 212° | С | С | С | С | Α | Α | AB | | С |
| Hydrofluosilicic Acid | 5% | 70° | С | С | | С | Α | Α | AB | | С |
| Hydrofluosilicic Acid Vapors | | 212° | | | | | | | AB | | С |
| Lactic Acid | 5% | Room | Α | Α | Α | Α | Α | Α | AB | AB | Α |
| Lactic Acid | 5% | 150° | Α | Α | Α | Α | Α | Α | | | Α |
| Lactic Acid | 10% | 150° to Boiling | A | | AB | А | А | A | | | В |
| Malic Acid | | Cold & Hot | Α | | | | Α | Α | AB | AB | Α |
| Molybdic Acid | 5% | Room | Α | | | | Α | Α | | | Α |
| Muriatic Acid | | Room | Α | | | | Α | Α | | | С |
| Nitric Acid | 5% | Room | Α | Α | Α | Α | С | Α | С | С | Α |
| Nitric Acid | 20% | Room | Α | Α | Α | А | С | Α | С | С | Α |
| Nitric Acid | 50% | Room | Α | Α | Α | Α | С | Α | С | AB | Α |
| Nitric Acid | 50% | Boiling | Α | Α | Α | Α | С | С | С | С | Α |
| Nitric Acid | 65% | Boiling | Α | Α | Α | Α | С | С | С | С | В |
| Nitric Acid | 95% | Room | Α | Α | Α | Α | С | Α | | | |
| Nitric Acid | Concentrated | Room | Α | Α | Α | Α | С | Α | | | Α |
| Nitric Acid | Concentrated | Boiling | Α | Α | Α | Α | С | С | | | В |
| Nitric Acid | Fuming | Room | | | Α | Α | С | Α | | | Α |
| Nitrous Acid | 5% | Room | Α | | | | | | | | Α |
| Oleic Acid | | Room | Α | | | Α | Α | Α | AB | AB | Α |
| Oleic Acid | 5% | Cold & Hot | A | | | С | Α | Α | AB | | A |
| Oleic Acid | 10% | Room | Α | | AB | Α | Α | Α | AB | | Α |
| Oleic Acid | 10% | Boiling | A | | AB | С | В | A | AB | | C |
| Phosphoric Acid | 1% | Room | A | | A | A | A | A | AB | | +A |
| Phosphoric Acid | 5% | Room | A | Α | A | A | A | A | AB | | A |
| Phosphoric Acid | 10% Still | Room | A | A | A | A | A | A | AB | AB | A |
| Phosphoric Acid | 10% Agitated | Room | A | A | A | A | A | A | AB | | A |
| Phosphoric Acid | 10% Aerated | Room | A | A | A | A | A | A | | | A |
| Picric Acid | Concentrated | Room | | | | | A | A | AB | | A |

| | | Acids | | | | | | | | | |
|----------------------|---------------|-------------------|----------|---------|-----------|----------|---------|---------|-------|---------|--------|
| Chemical | Concentration | Temperature °F | Tantalum | Niobium | Zirconium | Titanium | Alloy B | Alloy C | Monel | Inconel | 316 SS |
| Pyrogallic Acid | | | | | | | Α | Α | | | Α |
| Salicylic Acid | | | А | | | | Α | Α | AB | | |
| Stearic Acid | Concentrated | 200° | А | | | Α | Α | Α | AB | AB | Α |
| Succinic Acid | | Molten | | | | | В | В | | AB | |
| Sulfuric Acid | 5% | Room | А | | А | В | Α | Α | AB | AB | В |
| Sulfuric Acid | 5% | Boiling | А | | А | С | Α | В | С | С | С |
| Sulfuric Acid | 10% | Room | А | | А | В | Α | Α | AB | | В |
| Sulfuric Acid | 10% | Boiling | А | | А | С | Α | В | С | С | С |
| Sulfuric Acid | 50% | Room | А | | А | В | Α | Α | AB | | С |
| Sulfuric Acid | 50% | Boiling | А | | А | С | Α | С | С | С | С |
| Sulfuric Acid | Concentrated | Room | А | | С | С | Α | Α | AB | | А |
| Sulfuric Acid | Concentrated | Boiling | С | С | С | С | С | С | С | С | С |
| Sulfuric Acid | Concentrated | 300° | С | С | С | С | С | С | С | С | С |
| Sulfuric Acid | Fuming | Room | С | | | | Α | В | С | С | В |
| Sulfuric Anhydride | Dry | Room | С | | | | Α | Α | С | С | |
| Sulfurous Acid | Saturated | 375° | С | | В | | С | Α | С | С | В |
| Sulfurous Spray | | Room | А | | | | С | Α | С | С | С |
| Tannic Acid | 10% | Room | А | А | А | А | Α | Α | AB | AB | А |
| Tannic Acid | | 150° | А | А | А | А | Α | Α | AB | AB | А |
| Tartaric Acid | 10% | Room | А | | В | А | Α | Α | AB | | А |
| Tartaric Acid | | 150° | А | | В | А | Α | Α | AB | | А |
| Trichioroacetic Acid | | Room | А | | | А | Α | Α | | | А |
| Uric Acid | Concentrated | | | | | | Α | Α | | AB | А |

The information enclosed in this must be used as a general suggestion and not as a guarantee. The final selection of a material must be based on the actual evaluation of the metal in the corrosive medium under study.

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| | Miscella | neous Sol | utio | ons | | | | | | | |
|---|---------------|-------------------|----------|---------|-----------|----------|---------|---------|-------|---------|---|
| Chemical | Concentration | Temperature °F | Tantalum | Niobium | Zirconium | Titanium | Alloy B | Alloy C | Monel | Inconel | |
| Acetone | | Boiling | Α | Α | | | Α | Α | Α | Α | |
| Alcohol – Methyl, Propyl, Butyl, Ethyl | | Room | A | A | А | A | A | A | A | A | 4 |
| Alkaform | | Room | | | | | Α | Α | | | |
| Aluminum | | Molten | С | С | С | С | С | С | С | С | (|
| Aniline | Concentrated | Room | Α | | | | А | А | | | |
| Baking Oven Gases | | | Α | | | | Α | Α | | AB | |
| Beer | | | Α | | | | Α | Α | AB | | |
| Benzene | | Room | Α | | | Α | Α | Α | AB | AB | |
| Benzol | | Hot | Α | | | | Α | Α | AB | AB | |
| Bleaching Powder | Solution | Hot | С | | | | С | Α | С | С | Α |
| Blood (Meat Juices) | | Cold | Α | | | Α | Α | Α | Α | Α | |
| Borax | | Fused | С | | | | Α | Α | AB | | |
| Bromine | Dry | | Α | | | | С | Α | Α | Α | (|
| Bromine Water | - | Room | Α | | С | | С | Α | С | С | (|
| Buttermilk | | Room | Α | Α | | | Α | Α | | Α | |
| Camphor | | Room | Α | | | | Α | Α | | | 1 |
| Carbonated Beverages | | | Α | Α | | | Α | Α | AB | AB | 1 |
| Carbon Monoxide Gas | | 900° | С | С | С | С | А | Α | Α | Α | |
| Cadmium | | Molten | Α | | | | С | С | С | С | (|
| Caustic Lime | | | Α | Α | А | Α | Α | Α | Α | Α | 1 |
| Caustic Soda | | | С | | | | А | Α | Α | Α | ł |
| Chlorinated Water | Saturated | Room | Α | | С | Α | С | Α | С | С | E |
| Chlorine Gas Dry | | Room | Α | | В | С | А | Α | Α | Α | (|
| Chlorine Gas Moist | | Room | Α | | С | Α | С | Α | | | (|
| Chlorine Gas Moist | | 212° | Α | | | Α | С | С | С | С | (|
| Chloroform | | Room | Α | Α | А | Α | А | Α | Α | Α | ł |
| Chromium Plating Bath | | Room | Α | | | | | | С | С | Α |
| Cider | | Room | Α | А | А | Α | А | А | Α | А | / |
| Coffee | | Boiling | А | | | | А | А | AB | | / |
| Copal Varnish | | | Α | | | | А | А | AB | | 1 |
| Cream of Tartar | | | Α | | | | | | | | / |
| Creosote | | Hot | Α | | | | | | | Α | ŀ |
| Crude Oil | | | Α | | | | А | А | AB | | + |
| Developing Solutions | | Room | Α | | | | А | Α | | А | / |
| Distillery Wort | | | Α | | | | | | | | 1 |
| Dyewood, Liquor | | | Α | | | | | | | | |
| Ether | | Room | Α | | | Α | Α | Α | AB | AB | 1 |

| | Miscella | aneous So | luti | ons | ; | | | | | | |
|---|---------------|-------------------|----------|---------|-----------|----------|---------|---------|-------|---------|--------|
| Chemical | Concentration | Temperature °F | Tantalum | Niobium | Zirconium | Titanium | Alloy B | Alloy C | Monel | Inconel | 316 SS |
| Flue Gases | | | Α | | | | В | Α | | AB | AB |
| Fluorine | | | С | С | С | С | | | Α | Α | С |
| Food Pastes | | | Α | | | | Α | Α | AB | AB | Α |
| Formaldehyde | | Room | Α | Α | | Α | Α | Α | В | AB | *A |
| Fuel Oil | | Hot | Α | | | | Α | Α | AB | AB | A |
| Fuel Oil (w/ H ₂ SO ₄) | | | Α | | | | Α | Α | AB | AB | Α |
| Fruit Juices | | Room | Α | Α | | | Α | Α | AB | AB | Α |
| Furfural | | | Α | | Α | | Α | Α | AB | | Α |
| Gasoline | | | Α | Α | | | Α | Α | AB | AB | Α |
| Glauber's Salt | Solution | | Α | | | | Α | Α | AB | | Α |
| Glue (Dry) | | | Α | Α | Α | Α | Α | Α | Α | Α | Α |
| Glue (Solution Acid) | | Hot | Α | | | | Α | Α | | AB | Α |
| Glycerine | | Room | Α | | | | Α | Α | AB | | Α |
| Gypsum | | | Α | | | | | | | | Α |
| Hydrocarbons | | | Α | | | | Α | Α | AB | AB | |
| Ink | | | Α | Α | Α | Α | Α | Α | AB | AB | Α |
| lodine | | | | | | | | | | | |
| lodoform | | | Α | | | | | | | | Α |
| Kerosene | | Room | Α | Α | | | Α | Α | AB | | Α |
| Ketchup | | Room | Α | Α | | | Α | Α | AB | | Α |
| Lard | | Room | Α | Α | | | Α | Α | | | Α |
| Lead | | Molten | Α | | | | Α | Α | С | С | С |
| Linseed Oil | | | Α | | | | Α | Α | AB | Α | Α |
| Lye (Caustic) | 34% | 230° | С | С | | | Α | Α | Α | Α | Α |
| Lysol | | 212° | Α | Α | Α | Α | Α | Α | Α | Α | Α |
| Mayonnaise | | Cold & Hot | Α | Α | | | Α | Α | AB | AB | Α |
| Meats (Unsalted) | | Room | Α | | | | Α | Α | | | Α |
| Mash | | Hot | Α | | | | Α | Α | | | Α |
| Mercury | | | Α | | | | Α | Α | AB | Α | Α |
| Milk | | Hot or Cold | Α | Α | | | Α | Α | Α | Α | Α |
| Mine Water – Acid | | | Α | 1 | | | Α | Α | С | С | Α |
| Molasses | | | Α | | | | Α | Α | Α | Α | Α |
| Mustard | | Room | Α | | | | Α | Α | AB | | Α |
| Naptha | | | Α | Α | | | Α | Α | AB | AB | Α |
| Nitre Cake | | Fused | С | С | С | С | | | | | Α |
| Oils – Crude | | Hot & Cold | Α | Α | | | Α | Α | AB | | *A |
| Oils – Mineral or Vegetable | | Hot & Cold | Α | | | | Α | Α | AB | AB | Α |
| Parafin | | Molten | Α | Α | | | Α | Α | AB | | Α |

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| | Miscella | aneous So | luti | ons | | | | | | | |
|--------------------|---------------|-------------------|----------|---------|-----------|----------|---------|---------|-------|---------|------------------|
| Chemical | Concentration | Temperature °F | Tantalum | Niobium | Zirconium | Titanium | Alloy B | Alloy C | Monel | Inconel | |
| Paragoric Compound | | | Α | | | | Α | Α | | | 4 |
| Petroleum Ether | | | Α | Α | | | Α | Α | | | |
| Phenol | | | Α | Α | А | Α | Α | Α | А | Α | |
| Phenolic Resins | | | Α | Α | | | Α | Α | | | |
| Pine Tar Oil | | | Α | | | | Α | Α | AB | | |
| Potash | Solution | Hot | С | С | | | Α | Α | Α | Α | |
| Resin | | Molten | Α | | | | Α | Α | | AB | |
| Sal Ammoniac | 20% | Boiling | Α | | | | Α | Α | AB | | |
| Salt | Saturated | Room | Α | Α | Α | Α | Α | Α | Α | Α | ŕ |
| Salt Brine | Saturated | Hot | Α | | | Α | Α | Α | AB | AB | 3 |
| Sea Water | | | Α | Α | Α | Α | Α | Α | AB | AB | 7 |
| Sewage | | | Α | | | | | | | | - |
| Soaps | | Room | Α | | | | Α | Α | AB | | |
| Soy Bean Oil | | | Α | | | | Α | Α | AB | | |
| Soda Pulp | | | | | | | Α | Α | Α | Α | |
| Starch | Solution | | Α | | | | | | | | |
| Steam | | 212° | Α | Α | | | | | Α | Α | |
| Sugar Juice | | | Α | Α | | | Α | Α | Α | Α | |
| Sulfur – Dry | | Molten | Α | | | | Α | Α | С | С | |
| Sulfur – Wet | | | Α | | | | | | С | С | |
| Tin | | Molten | Α | | | | Α | Α | С | С | |
| Tomato Juice | | Room | Α | Α | | | Α | Α | AB | AB | 7 |
| Turpentine Oil | | | Α | Α | | | Α | Α | AB | | |
| Tung Oil | | | Α | | | | Α | Α | | AB | |
| Varnish | | | Α | | | | Α | Α | AB | AB | |
| Vegetable Juices | | Room | Α | Α | | | Α | Α | AB | AB | |
| Vinegar – Still | | Room | Α | | Α | | Α | Α | AB | AB | |
| Vinegar – Agitated | | Room | Α | | | | Α | Α | | AB | |
| Vinegar – Aerated | | Room | A | Α | | | A | A | | AB | |
| Vinegar – Fumes | | | A | | | | A | A | | AB | |
| Vinegar & Salt | | | A | | | | A | A | | AB | $\left \right $ |
| Water | | | A | Α | Α | Α | A | A | Α | A | |
| Water | | Hot | A | A | A | A | A | A | A | A | |
| Water – Salt | | | A | A | A | A | A | A | AB | AB | , |
| Water – Sea | | | A | A | A | A | A | A | AB | AB | |
| Whiskey | | | A | A | | | | | A | A | |
| Zinc | | Molten | A | | | | С | С | C | C | |





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