

Refractory Metals Resistance to Corrosive Materials Guide

	Tantalum	Columbium	Zirconium	Titanium	Hastelloy C-276 (nickel-chromium-molybdenum)	Hastelloy B-2 (nickel-molybdenum)	Monel No. 400 (nickel-copper)	Carpenter 20 (high-nickel stainless steel)	316 stainless steel
Acetic acid, 50%, boiling	1	1	1	1	1	1,2	1	1	
Aluminum chloride, 5%	1	1	4	1	1	1,2	1	3	
Ammonium chloride, 50%	1	1	1	4	1	4	1	1#	
Ammonium sulfate, saturated, boiling	1	4	4	4	2	1	1,2	1#	
Bromine, dry	1	4	4	4	2	1	1,2	1#	
Bromine, water	1	1	4	4	1	3	3	1,2 3	
Caustic soda	3	3	4	4	1	1	1	1	
Chlorine gas, dry, 25°C	1	1	2	3	1	1	1	3	
Chlorine gas, moist, 25°C	1	1	3	1	1	3	4	3	
Chlorine gas, moist, 100°C	1	1	3	1	3	3	3	3	
Chlorosulfonic acid, 10%	1	4	4	4	1	1	1,2	3	
Chromium-plating bath	1	4	4	4	4	4	3	1,2	
Ferric chloride, 5% agitated	1	1	3	1	1	3	4	3	
Flue gas	1	4	4	4	1	2	4	1,2 1,2	
Flourine	3	3	4	4	4	4	1	2,3 3	
Hydrochloric acid, 38°C (all concentrations)	1	2	1	3	1	1	4	3	
Hydrogen peroxide, 25°C	1	2	1	1	1	2	1,2	1	
Lead, molten	1	4	4	4	1	1	3	4	
Mine water, acid	1	4	4	4	1	1	3	1	
Nitric acid, 5%, 25°C	1	1	1	1	1	3	3	1	
Nitric acid, conc., boiling	1	1	1	1	3	3	4	1	
Potassium cyanide	1	4	4	4	1	1	1,2	1	
Sodium chloride, sat., boiling	1	4	4	1	1	1	1	1	
Sodium hypochlorite, 5%, 25°C	4	3	2	2	1	3	3	2	
Sulfur dioxide, moist 25°C	1	1	4	1	1	3	3	1	
Sulfuric acid, 5%, 25°C	1	1	1	2	1	1	1,2	1	
Sulfuric acid, 50%, boiling	1	3	1	3	3	1	3	2,3 3	

Subject to pitting at air line or when allowed to dry

* Attack may occur when sulfuric acid is also present

- 1: Fully resistant
- 2: Some attack
- 3: Unsatisfactory
- 4: No data available