

ALKALIES

Sodium Hydroxide

Sodium hydroxide solutions at comparatively low temperatures and concentrations are quite noncorrosive to both the chromium and chromium-nickel alloys. Higher and inconsistent corrosion rates occur in more concentrated solutions and are somewhat accelerated under applied pressure¹².

Typical corrosion rates for several stainless steels are shown in Table 15.32. Potassium hydroxide solutions would be expected to show similar action on stainless steels.

The isocorrosion graph in Figure 15.9 summarizes the performance of the austenitic chromium-nickel stainless steels in sodium hydroxide. The indicated rates hold true primarily for Types 304 and 316. A stress-corrosion cracking zone based on failures reported in the literature is also shown in the graph. The boundary of the cracking zone is shown as a broken line, because the zone still may not be completely defined. Most of the cracking failures have occurred at temperatures near the boiling point. Where failures have been reported below the boiling point, there is a possibility that sodium chloride may have been present in the solutions and contributed to the failures. Aeration and corrosion rates may also be factors influencing the cracking.

TABLE 15.32. CORROSION OF STAINLESS STEELS BY SODIUM HYDROXIDE SOLUTIONS^{a,b}

Type	Concentration, %	Temperature, °F	Test duration, days	Corrosion rate, mpy
410	20	122 to 140	134	0.1
430	20	122 to 140	134	0.1
309	20	122 to 140	134	<0.1
310	20	122 to 140	134	<0.1
302	20	122 to 140	134	<0.1
304	22	122 to 140	133	<0.1
410	72	245 to 255	119	6 ^a
430	72	245 to 255	119	32 ^a
304	72	245 to 255	119	3.7 ^a
316	72	245 to 255	119	3.1 ^a
329	72	245 to 255	119	0.3 ^a
21Cr-34Ni-0.5Cu	72	245 to 255	119	0.1 ^a
302	73	212 to 248	88	38 ^b
304	73	212 to 248	88	45 ^b

^a Solution was moderately aerated.
^b No aeration of solution.

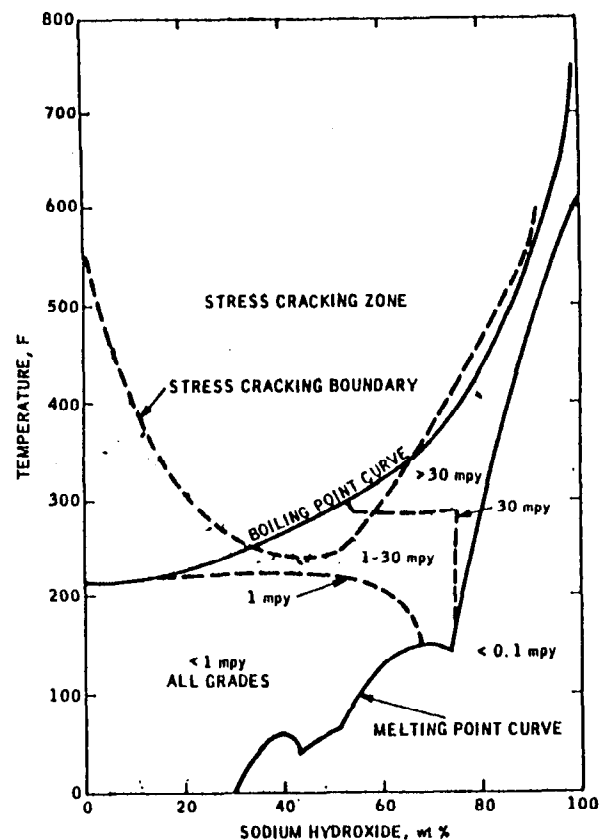


FIGURE 15.9. Isocorrosion chart for austenitic Cr-Ni stainless steels in sodium hydroxide^{14A}.

Ammonium Hydroxide

Stainless steels show good resistance to all concentrations of ammonia and ammonium hydroxide solutions up to the boiling point. Above the atmospheric boiling point, the corrosion rate may increase rapidly, particularly in anhydrous ammonia. In liquid ammonia containing ammonium acetate at 483° F and 1200 psig, Type 304 had a rate of 1060 mpy; under the same conditions, Type 316 had a rate of 14 mpy.

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