

Different Types of Corrosion

- Recognition, Mechanisms & Prevention

Hydride Embrittlement

Recognition of Hydride Embrittlement

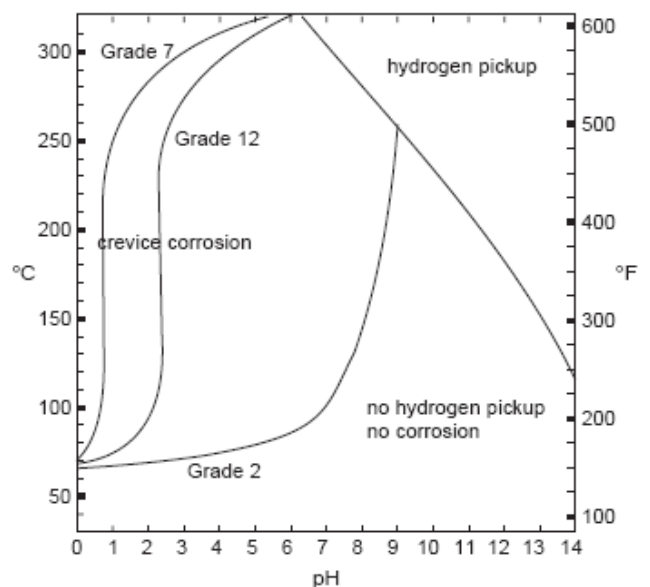
What is hydride embrittlement? Hydride embrittlement refers to the cracking caused by the formation of brittle metal hydrides in some reactive metals such as magnesium, tantalum, niobium, vanadium, zirconium, titanium and their alloys in a hydrogen-containing environment. The phenomenon is sometimes called "hydride cracking".

Mechanisms of Hydride Embrittlement

What causes hydride embrittlement? Atomic hydrogen atoms diffuse into the metal and react with the metal atoms to form a brittle metal hydride phase (MH_x), which precipitates in the metal where it affects the mechanical properties and initiates cracking.

The hydrogen may originate from welding work without adequate protection with regard to the environment, a heat treatment, corrosion processes or a casting operation without a controlled atmosphere.

Stresses in the metal accelerate the formation of hydride. Consequently, hydride formation will recur in the stress field at the crack tip, and the crack will continue to propagate until failure.



The graph shows the temperature-pH limits for some titanium alloys in NaCl brines.

Prevention of Hydride Embrittlement

How to prevent hydride embrittlement? Hydride embrittlement can be prevented through:

- Avoid hydrogen pickup
- Control temperature
- Reduce stress
- Reduce corrosion

For more details on Hydride Embrittlement

Where can I learn more about hydride embrittlement? More details on hydride embrittlement are included in the following corrosion courses which you can take as in-house training courses, course-on-demand, online courses or distance learning courses:

Corrosion and Its Prevention (5-day module)

API 571 Damage Mechanisms Affecting Fixed Equipment in the Refining and Petrochemical Industries (5 days)

Corrosion, Metallurgy, Failure Analysis and Prevention (5 days)

Marine Corrosion, Causes and Prevention (2 days)

Materials Selection and Corrosion (5 days)

If you require corrosion expert witness or corrosion consulting service on hydride embrittlement, our NACE certified Corrosion Specialist is able to help. Contact us for a quote.