UNH Materials Science Seminar

11:00-12:00, Thursday, November 18, 2004
DeMeritt Hall 209B
University of New Hampshire

Seawater Crevice Corrosion of Ni-Cr-Mo Alloys

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Ni-Cr-Mo alloys such as Alloy 625 are employed in conditions where corrosion resistance is critical. These materials derive their corrosion resistance from a thin oxide film on the metal's surface that limits the kinetics of the thermodynamically favorable processes related to corrosion. Alloy 625, like all passive alloys, can exhibit significant corrosion when conditions develop that destabilize the passive film. One such condition can occur in seawater, in the tight space between the metal surface and gaskets or o-rings. This form of degradation is referred to as crevice corrosion. Small amounts of solution present in the tight interfacial pore spaces become deoxygenated and strongly acidified -- two factors among many that destroy the passive film and result in significant corrosion rates. This seminar highlights results from recent experimental studies into seawater crevice corrosion of Alloy 625 and similar alloys. These studies have revealed the relationships between Ni-Cr-Mo alloy crevice corrosion resistance and environmental factors such as temperature, crevice tightness, and a biofilm-related process that only occurs in constantly-refreshed natural seawater. These studies demonstrate that a combination of seemingly benign factors can lead to significant corrosion risks for Ni-Cr-Mo alloys in seawater.

Farrel Martin is a senior engineer with GEO-Centers, working at the US Naval Research Laboratory (NRL) in Washington, DC. He holds a PhD from Purdue University in Civil Engineering Materials (2001), where his graduate work focused on corrosion inhibition of reinforcing steel in concrete. He holds an MS from Penn State University in Engineering Science, where he led the development of a chromium-free corrosion resistant alloy for use in the near net-shape technology of press-and-sinter powder metallurgy. Dr. Martin has collaborated in the development of instruments and sensors that quantify engineering properties related to embrittlement, high temperature corrosion, cathodic protection, and coatings preservation. He is active in NACE International and The Electrochemical Society, where he serves on the Publication Committee.