Examining corrosion currents of copper-steel coupling during early oxic phase with coupled multi-electrode array

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Abstract

In several countries, a favoured design concept for nuclear waste disposal programs is a two part container consisting of iron-based inner structure with outer copper coating. Copper is being considered as a primary material for ensuring the effective containment of radionuclides. During the deposition process, a possibility of damage to the copper coating is identified. If such damage occurs, galvanic corrosion between copper and steel can happen. This present work focuses on examining corrosion current of steel when is galvanically coupled to copper in oxic environment with coupled multi-electrode array (CMEAs). Study will be performed in a simulated saline groundwater and in bentonite slurry at room temperature and under open circuit potential. The attention will be given to evolution of corrosion currents of 25 coupled electrodes, where only one is made of steel and others are made of copper. In early oxic phase when the copper coating in damaged, high corrosion currents are expected to be detected. In order to compare the evolution of corrosion currents without simulated container damage, we will also conduct CMEAs measurements on a sample where all 25 electrodes are made of copper. After CMEAs measurements, different microscopic and microCT scans will be conducted on electrodes to verify the type and extent of the corroded damage.

References:

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