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Modeling of Corrosion of Corrosion Resistant Alloys

A Mechanistic Approach to Predict Corrosion in Chemical Processes Environments including Mixed Acids and Salts

ABSTRACT

Pure acids as well as their mixtures with/without salts lead to significant corrosion issues in chemical processes. Corrosion resistant alloys (CRAs) are often employed in such environments to mitigate the corrosion risks. However, corrosion behavior of such alloys at wide ranges of process conditions needs to be reliably predicted.

In order to provide a reliable and consistent solution, OLI Systems thermodynamicists Dr. Ali Eslamimanesh and Dr. Andre Anderko provide a rigorous predictive tool for analyzing corrosion in chemical processes particularly in acids and their mixtures.

For this purpose, the OLI Systems corrosion modeling framework is extended and refined, on the basis of literature data, to simulate the corrosion behavior of various nickel-base alloys and stainless steels in systems relevant to the chemical process industry, with a focus on acids, salts, and their mixtures. In addition, the same modeling scheme is used to evaluate localized corrosion of the studied alloys in systems relevant to oil and gas production by calculating corrosion rate, corrosion potential, and repassivation potential as a function of environment speciation, temperature, pH, and partial pressure of gases including CO2 and H2S.

The results show acceptable accuracy of the model in representing the literature data. The OLI Systems corrosion model helps the users understand the complexity of corrosive environments and predict localized and general corrosion of CRAs as a function of wide range of operational conditions and alloy compositions.

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