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316L Passive Film Modification During Pitting Corrosion Process

Authors : Amina Sriba

Abstract : In this work, interactions between the chemical elements forming the passive film of welded austenitic stainless steel during pitting corrosion are studied. We pay special attention to the chemical elements chromium, molybdenum, iron, nickel, and silicon since they make up the passive film that covers the fusion zone's surface in the welded joint. Molybdenum and chromium are typically the two essential components that control the three crucial stages of pit formation. It was found that while the involvement of chromium is more prominent during the propagation of a pit that has already begun, the enrichment of the molybdenum element in the passive film becomes apparent from the first stage of pit initiation. Additionally, during the pitting corrosion process, there was a noticeable fluctuation in the quantities of the produced oxides and hydroxide species from zone to zone. Regarding the formed hydroxide species, we clearly see that Nickel hydroxides are added to those of Chromium to constitute the outer layer in the passive film of the fusion zone sample, compared to the base metal sample, where only Chromium hydroxide formed on its surface during the pitting corrosion process. This reaction is caused by the preferential dissolution of the austenite phase instead of ferrite in the fusion zone.

Keywords : fusion zone, passive film, chemical elements, pit
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