MULTISCALE CORRELATIVE CHARACTERIZATION OF ENVIRONMENTALLY ASSISTED CRACK INITIATION, PROPAGATION AND FAILURE IN A HIGH STRENGTH AA5083 H131 ALLOY

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Environmentally assisted cracking in a high strength AA5083 H131 alloy has been investigated using a multiscale correlative characterization approach to understand the surface intergranular corrosion to environmentally assisted crack (EAC) transition. Time-lapse 3D synchrotron X-ray tomography was employed during slow strain testing of a sensitized AA5083 sample sensitized at 80 °C for 250 h. In addition, several of the specimens tested were pre-exposed to a chloride containing environment to induce corrosion sites which could act as 'realistic' stress raisers in the subsequent straining. Reconstructed volumes of the X-ray CT time-lapse series allowed us to track and follow crack propagation in the material during slow strain rate testing at high resolution <5 µm. Volumes of interest from the test samples identified from the X-ray CT reconstructions were further analyzed post-mortem using electron microscopy and spectroscopy based techniques to study the presence and chemistry of secondary phases such as those based on Mg-Si, and their role in the initiation, propagation and/or arrest of crack tips/fronts.