

**A novel application of the scanning vibrating probe
for determination of coupling currents:
Understanding the mechanisms SCC in 5000 series Al
alloys**

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When as-received or sensitized AA5083 are immersed in an electrolyte, a growing crack creates a galvanic couple with the external surfaces according to the differential aeration hypothesis. Monitoring the resulting “coupling current” yields information about the mechanisms of crack advance. The purpose of this study is to determine if the scanning vibrating electrode technique (SVET) can be used to spatially resolve the coupling current flowing through the solution from the crack to the external surfaces. Preliminary feasibility studies were performed to map the current/potential in larger galvanic couples designed to simulate Cu-rich intermetallics dispersed in an aluminum matrix. A novel horizontal fracture mechanics apparatus, designed to apply a known stress intensity, was employed to reveal the onset of subcritical crack growth. As a result of the preliminary studies, we successfully designed a setup to allow the typical fracture mechanics testing to occur with the SVET. We report on the progress that has been made in utilizing a customized four-point bend, fracture mechanics device that allows for simultaneous loading and electrochemical mapping. Spatially resolved coupling current/potential maps indicate that both the notch and the crack-tip become and remain anodic for most of the crack growth process.