

EFFECT OF SENSITIZATION ON THE STRESS CORROSION CRACKING OF AA5083

Ramgopal Thodla, DNV GL, 5777 Frantz Road, Dublin, OH – 43017, USA
ramgopal.thodla@dnvgl.com

A. K Vasudevan, TDA Inc, 3190 Faiview Dr, Falls Church, VA22043, USA

William Nickerson, Office of Naval Research - 875 N Randolph Street, Rm1132, Arlington, VA 22203, USA

Stress corrosion cracking of AA5083 was evaluated using both slow strain rate testing, there was a strong effect of sensitization with aging time. Increasing aging time leads to a sharp decrease in strain to failure, as well as ultimate tensile strength (UTS). In the fully sensitized condition (175°C/240h) there was a significant effect of chloride concentration, with increasing chloride concentration leading to a sharp decrease in strain to failure and UTS. However, in the as received condition there was no significant effect of chloride concentration on the slow strain rate behavior. The difference in behavior is likely associated with continuous precipitation of β phase along the boundaries. Rising displacement tests were performed as a function of sensitization time and the K_{th} measured decreased sharply with aging time reaching $\sim 4\text{MPa}\sqrt{\text{m}}$ at 240h. The effect of chloride concentration and applied potential in the sensitized condition (175°C/240h) was evaluated and the K_{th} decreased with increasing chloride concentration. At applied potentials below the breakdown potential of β there was an increase in the K_{th} but the values of K_{th} were not as those observed in the as received condition. The observations made suggest that the stress corrosion cracking of AA5083 was sensitive to the applied potential and chloride concentration which in turn control the crack tip conditions. The observed data were analyzed in terms of a crack tip strain rate model to quantify the behavior of AA5083.