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CDM modeling for corrosion–fatigue life prediction of aluminum alloys

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ABSTRACT

In this study a simple CDM-based corrosion-fatigue model is developed to study the pit to crack transition life in aluminum alloys (Al7075-T651 and Al2024-T351). This study is based on the experimental observation of reduced fatigue life in presence of corrosive environment. Both cases of precorroded fatigue damage and concurrent corrosion-fatigue damage are discussed. The model is based on the assumption that stress field has no effect on the kinetics of corrosion however, corrosion-induced damage enhances fatigue damage. Model results show significant reduction in fatigue crack initiation life in both cases of precorrosion and concurrent corrosion–fatigue. The model takes into account the effect of stress, frequency, and temperature on the pit to crack transition life. Model results are compared with the experimental data when available.