NUMERICAL INVESTIGATION OF A GALVANIC STRUCTURAL JOINT SUBJECTED TO A MECHANO-ELECTROCHEMICAL LOADING

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Here, we present for the first time, an experimentally validated numerical model for a galvanic couple subjected to a mechano-electrochemical process. The model is capable of tracking moving boundaries of the corroding constituent of the couple by employing Arbitrary Langrangian Eulerian (ALE) method. Results show that, when an anode is under a purely elastic deformation, there is no apparent effect of mechanical loading on the electrochemical galvanic process. However, when the applied tensile load is sufficient to cause a plastic deformation (local internal stress gradient), the local galvanic corrosion activity at the vicinity of the interface is increased remarkably. The effect of other factors, such as electrode area ratios, electrical conductivity of the electrolyte and depth of the electrolyte, are studied. It is observed that the conductivity of the electrolyte significantly influences the surface profile of the anode, especially near the junction.