

Formation of Calcareous Deposits in Marine Environments

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ABSTRACT

Cathodic protection is one of the successful ways to prevent corrosion of steel structures in submerged marine environments. A unique feature of cathodic protection in seawater is the formation of calcareous deposits on metal surfaces. These deposits not only reduce cathodic current requirements by physically forming a resistive barrier between the metal and seawater but also mitigate corrosion reactions when the cathodic current source is interrupted or terminated. In the present study, calcareous deposits that formed in natural seawater upon ASTM A710 steel polarized either potentiostatically, galvanostatically, or by a mixed-mode technique (initially galvanostatic followed by potentiostatic) were investigated. Parameters discussed included variation of current density (potentiostatic control) or potential (galvanostatic control) with time, total charge transfer, deposit thickness, and thickness-to-charge ratio. Based upon these parameters, the mixed-mode technique was appraised to provide the deposit with greatest protective properties within the time frame of the experiments.