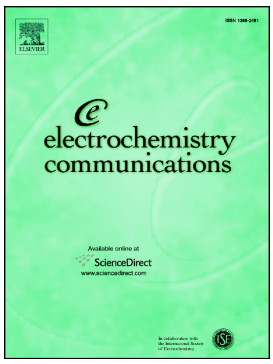

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Application of a modified bi-polar electrochemistry approach to determine pitting corrosion characteristics

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Abstract

The application of bi-polar electrochemistry produces a linear potential gradient between two feeder electrodes, allowing the full spectrum of anodic to cathodic reaction kinetics to be controlled. A modified bi-polar approach is introduced, by superimposing a constant electrochemical potential on the potential gradient, thereby controlling the location and spatial distribution of anodic to cathodic reactions along the exposed sample surface. Application of this approach is demonstrated by controlling the extent of pitting corrosion in austenitic stainless steel as a function of the applied potential.

Keywords

Bi-polar electrochemistry, stainless steel, pitting corrosion, potentio-static polarisation

Introduction

Bi-polar electrochemistry produces a linear potential gradient between two feeder electrodes. A metallic sample exposed to such a potential gradient solicits spatially separated anodic to cathodic electrochemical reactions along the sample surface [1–5]. This provides the means to obtain a continuous spectrum of electrochemical polarisation characteristics on one sample surface, as a function of distance between both feeder electrodes. Applying bi-polar electrochemistry therefore provides a wireless, non-contact setup for fast throughput corrosion screening [1, 6, 7].