Design of modified bipolar electrochemistry approach for corrosion research and engineering application

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Abstract

The application of bipolar electrochemistry results in a potential gradient acting along the working electrode surface, which in turn yields the full spectrum of anodic-to-cathodic polarisation responses. Bipolar electrochemistry can be used to study different types of corrosion, from crevice corrosion, pitting corroissn, general corrosion, passivation area, and cathodic response can be obtained on one BPE sample in a single experiment. However, one of the limitations of bipolar electrochemistry for corrosion screening is that corrosion behaviour at higher (or lower) applied potentials cannot be observed. The bipolar electrochemistry set-up was therefore modified to investigate the effect of a superimposed applied potential, and the effect of asymmetrically acting potential gradients on the working electrode. These novel bipolar electro-chemistry set-up designs enable the assessment of a number of corrosion processes to be investigated.

Keywords

Bipolar electrochemistry, corrosion electrochemistry, pitting corrosion, galvanic corrosion, stainless steel