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AMINO ACIDS: INHIBITORS OR PROMOTERS OF ANAEROBIC BIOCORROSION OF STEELS?

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ABSTRACT

Various authors have shown that some amino acids can act as corrosion inhibitors, which has generated an increasing interest in these compounds as substitutes to conventional corrosion inhibitors that are usually toxic [1,2]. Nevertheless, in the field of biocorrosion amino acids have been demonstrated to be able to enhance the corrosion process. Their role in biocorrosion is considered to be of two types: an acidifying role at the vicinity of the metal, or a chelating role that binds the metal ions issued from the corrosion process and can result in the formation of ion concentration cells, causing further corrosion on the metal surface [3,4]. The present study proposed another possible role of amino acids in anaerobic biocorrosion of steels. Voltammetric and potentiometric experiments were carried out with 316L stainless steel in solutions containing leucine or lysine at different concentrations and pH. The results demonstrated that the cathodic reaction was enhanced by the presence of amino acids, certainly because of the reduction of the hydrogen atoms linked to the amine or carboxylic acid groups. A so-called deprotonation mechanism, which produces molecular hydrogen, has already been demonstrated with phosphate ions and weak acids [5,6]. It introduces a new reversible cathodic reaction that may enhance the corrosion process, particularly when a downstream reaction of hydrogen consumption occurs.

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