PRELIMINARY STUDIES ON ELECTROCHEMICAL BEHAVIOUR OF SULPHITE ON STAINLESS STEEL IN NEUTRAL MEDIA

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Abstract

SO_2 emissions are widely converted to sulphite through the flue gas desulphurization process, in which SO_2 is scrubbed and then chemically absorbed as sulphite (SO_3^{2-}) in alkaline solutions [1]. Furthermore, the oxidation of SO_3^{2-} ions can produce additional benefits, such as generation of an energy carrier like hydrogen [2]. Sulphite electrooxidation occurs in both acidic and alkaline media, according to the reaction (1) and (2), respectively [3]:

$$SO_3^{2-} + H_2O \rightarrow SO_4^{2-} + 2H^+ + 2e^- \quad (1)$$

$$SO_3^{2-} + 2HO^- \rightarrow SO_4^{2-} + H_2O + 2e^- \quad (2)$$

Several studies regarding the sulphite electrooxidation were performed using noble metals such as platinum [4] and gold [5] due to their good catalytic activity [6], but the high price of these materials is a major drawback for their widespread use, therefore the present paper targets low-cost electrodes such as AISI 420 and Incoloy 800.

In this paper, the anodic oxidation of the sulphite ions on AISI 420 and Incoloy 800 electrodes in neutral solution (1 mol L^{-1} Na_2SO_4) was studied to determine the relationship between the kinetic parameters and the sulphite concentration added in the electrolyte (10^{-3}, 10-2, 10-1, 0.5 and 1 mol L^{-1}). Due to their electrochemical stability in aqueous solutions, in acidic and neutral electrolytes, stainless steal electrodes can be a practical alternative as anode material. Also, their tendency to passivation can be an advantage both due to the high corrosion resistance and the catalytic effict on the anodic oxidation of sulphite [7].

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