The Pitting Corrosion Behavior of Copper with Different Grain Size

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In this paper, the pitting corrosion behaviours of copper materials with different grain sizes (average grain sizes of 23, 67, and 470 μm) were investigated based on cyclic polarization and electrochemical impedance spectroscopy (EIS). The results showed that a very protective passive film without any pitting can be observed in NaOH solutions. The pitting corrosion behaviours were observed in a Na_2SO_4 solution and a $\text{Na}_2\text{SO}_4 + \text{NaOH}$ solution. The pitting susceptibility of copper decreased with the increasing grain size in the Na_2SO_4 solution due to a decrease in the electrochemically active surface area. In contrast, the pitting susceptibility increased with increasing copper grain size in the $\text{Na}_2\text{SO}_4 + \text{NaOH}$ solution, which was related to a decrease in the quality of the formed passive film.

Keywords: Copper; Pitting corrosion; Grain size; Cyclic polarization; Electrochemical impedance spectroscopy

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