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Corrosion behaviour of cast and deformed copper- carbon nanotube composite wires in chloride media

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ABSTRACT

Copper-carbon nanotube (Cu-CNT) composite wires were produced by casting, rolling and drawing to produce composites with 0.05 wt% CNTs embedded at the grain boundaries of copper. The corrosion properties of wires were investigated in mild and highly corrosive media: solution I consisting of 0.05 wt% sodium chloride (NaCl) and 0.4 wt% ammonium sulfate $(NH_4)_2SO_4$ and solution II consisting of 3.5 wt% NaCl. Composite samples showed similar behaviour and corrosion rates as oxygen free copper in solution I. In 3.5 wt% NaCl all composite samples showed slight improvement in corrosion resistance when compared with oxygen free copper. The corroded wire surfaces after five days in 3.5 wt% NaCl showed less dissolution for composite samples compared with pure copper. The observed decreased corrosion rate for composite wires with embedded CNTs is suggested to be due to reduced cathodic reaction. Galvanic current density between pure copper and carbon nanotubes was observed by mixed potential theory and zero resistance amperometry, neither of which showed tendency towards microgalvanic activity. The results indicate

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