Influence of SnO₂ nanoparticles incorporation on the Electrochemical Behaviour of a Superconductor in Sodium Sulphate Solutions

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The influence of SnO₂ nanoparticles addition on the corrosion and capacitive behaviour of (SnO₂)_x(Bi,Pb)-2223, where x=0.00, 0.025, and 0.1wt. % phase superconductor in 0.1 mol L⁻¹ Na₂SO₄ at 30⁰C was studied using potentiodynamic polarization curves measurements, cyclic voltammetry and electrochemical impedance spectroscopy (EIS) techniques. . The prepared samples were characterized by X-ray diffraction (XRD), transmission electron microscopy (TEM) as well as scanning electron microscopy (SEM). XRD patterns showed that nano-sized SnO₂ are located at the surface and grains boundaries reducing the voids present in the (Bi,Pb)-2223 matrix as displayed by SEM photographs. Such fact is confirmed by TEM images that also assured the presence of nanosized SnO₂ particles in the phase matrix. The electrochemical techniques showed that the corrosion current density (*i*_{corr}) decreases with increasing both SnO₂ nanoparticles percentages and the time elapsed from the preparation of superconductor samples. Cyclic voltammetry (CV) measurements showed that 0.025% SnO₂ containing superconductor is a good choice for electrochemical capacitor applications. The corrosion process was found to be controlled not only by charge transfer, but also by the diffusion process.

Keywords: corrosion behaviour, superconductors, nanoparticles, cyclic voltammetry, humid media, electrochemical impedance.

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