PÔSTER - RESUMO - DISPOSITIVOS ELETRÔNICOS, ELETROQUÍMICOS, SUPERCAPACITORES E BATERIAS

PROCESSING AND CHARACTERIZATION OF MIXED NIOBIUM-TANTALUM OXIDE OBTAINED FROM TANTALITE ORE

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The beneficiation of mineral resources is an important step to ensure chemical purity, added value, and sustainability in the development of advanced functional materials [1]. In this work, mixed niobium-tantalum oxide (Nb2O5:Ta2O5) was obtained from beneficiated tantalum ore extracted from natural deposits located in Parelhas, Brazil [2]. A paste of the material was formulated and deposited onto fluorine-doped tin oxide (FTO) substrates by spin coating. The deposited films were subsequently subjected to thermal treatment at 500 °C for 2 h to promote crystallization and remove organic residues. Structural characterization by X-ray diffraction confirmed the presence of crystalline phases corresponding to niobium oxide and tantalum oxide. Morphological analysis by scanning electron microscopy revealed particles with irregular morphology and a relatively broad size distribution, with an average

particle size of approximately 190 nm. The chemical composition of the mixed oxide was quantified by inductively coupled plasma mass spectrometry (ICP-MS), which indicated a Nb:Ta molar ratio of 1.92:1.0 and and an approximate mass ratio of 1:1. Electrical properties were investigated through a combination of current density–voltage (J–V) curves, electrochemical impedance spectroscopy (EIS), and charge extraction by linearly increasing voltage (CELIV) measurements. These techniques enabled the evaluation of charge transport, interfacial resistance, and effective charge carrier mobility within the Nb2O5:Ta2O5 films. Overall, the results demonstrate the potential of beneficiated tantalite as a sustainable source for Nb2O5:Ta2O5 films. while highlighting the need for further optimization to improve film uniformity and electrical performance for advanced applications. While further optimization is required to improve film uniformity and electrical performance, the proposed approach represents a promising pathway for integrating mineral beneficiation with the development of advanced oxide materials for electronic applications.

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Palavras-chave: mixed niobium-tantalum oxide; sustainable materials; mineral processing; electrical characterization.