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Niobium oxide- carbon nanotube electrodes for supercapacitors, prepared using microwave-hydrothermal synthesis

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Niobium pentoxide (Nb_2O_5) is a promising material for energy storage in supercapacitors due to its thermodynamic stability, relatively high capacitance and excellent pseudo-capacitance characteristics. However, this material has poor electrical conductivity. New strategies have been used to overcome this barrier, which involved morphology modification and fabrication of advanced composites with carbon-based materials, such as carbon nanotubes (CNTs), which present high conductivity and chemical stability. In this context, the microwave-assisted hydrothermal synthesis (MHS) has been used because of its advantages such as low reaction time, homogeneous nucleation, the growth of uniform nanoparticles, and increased absorption of carbon materials. Thus, this work reports the fabrication of electrodes from Nb_2O_5 nanocrystals and CNTs by MHS (pseudo-hexagonal Nb_2O_5 phase) as obtained and after thermal treatment (orthorhombic Nb_2O_5 phase). Both phases were confirmed by XRD and Raman analyses. Also, Nb_2O_5 nanoparticles grew homogeneously and were well dispersed on the CNTs surface as observed by TEM technique. The cyclic voltammetry curves exhibited an ideal shape at various scan rates (2, 5, 10, 20, 50, and 100 mV/s) in the Na_2SO_4 electrolyte with a potential window of 0 to 0.8 V.

Biography

Ricardo Marques e Silva is a Ph.D. candidate at the Federal University of Pelotas, Brazil. He studied at Silesian University of Technology, Poland, and currently, is an exchange student at McMaster University, Canada. He has developed materials and composites by microwave-hydrothermal synthesis for obtaining of different nanoparticles. Some of the applications are supercapacitors, photocatalysis, and sensors.

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