

**Synthesis and characterization of WO₃ nanoparticles and WO₃-rGO nanocomposite:
Electrochemical application.**

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Abstract

In the present work, we report the synthesis of tungsten oxide and WO₃-rGO nanocomposites with different graphene oxide contents (the graphene content varied from 1 to 7 wt%) by a hydrothermal process using Cetyltrimethylammonium bromide (CTAB) as surface ligand. The graphene oxide sheets precursor used in the synthesis of WO₃-rGO nanocomposite were prepared using an improved Hummers' method. The crystallinity and the purity of the prepared compound were investigated by X-ray diffraction. Raman and Fourier-transform infrared spectroscopies were used to study the vibration modes and the chemical bonds present in the prepared compound. The effect of graphene addition on the morphology of tungsten oxide nanoparticles were characterized by using transmission electron microscopy and scanning electron microscopy. Transmission electron microscopy shows a marked change in the morphology of tungsten nanoparticles by graphene oxide sheets addition. The results confirm that the interface between tungsten oxide and graphene contains chemical bonds. The optical properties were investigated using ultraviolet-visible diffused reflectance spectroscopy and photoluminescence spectroscopy. An improvement of optical properties was shown by graphene oxide sheets addition. The electrochemical performances were investigated using the cyclic voltammetry (CV) technique.

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