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Investigation of some physical properties of pure and Co-doped MoO3 synthesized on glass substrates by the spray pyrolysis method

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Abstract: Pristine and Cobalt (Co)-doped MoO3 nanofilms were synthesized on glass substrates using the spray pyrolysis method. The nanometric pristine MoO3 films were prepared from the 10?2 M.L-1 solution of ammonium molybdate tetrahydrate [(NH4)6Mo7O24,4H2O] in distilled water. Co-doping at 0.5, 0.75 and 1% was achieved by adding cobalt (II) chloride hexahydrate (Cl2CoH12O6) in the pristine solution. The structure and the morphology of the films were investigated by means of X-ray diffraction and atomic force microscopy: two pronounced (020) and (040) peaks corresponding to the orthorhombic structure phase of ?-MoO3 were detected. The AFM observations revealed the formation of micro-plates, parallel to the surface plane, with a roughness ranging from 33?nm to 54?nm. Optical properties were investigated through reflectance, transmittance and photoluminescence measurements. The optical band gap, the Urbach energy and the refractive index were deduced from these measurements. The presence of oxygen vacancies was revealed from the interband transitions in the blue and green domains. Co-doped MoO3 nanofilms showed ferromagnetic behavior. The photocatalytic degradation of an aqueous solution of methylene blue (MB) under UV irradiation, in the presence of Co-MoO3 nanomfilms, has been carried out using UV–vis spectrometery: the intensity of the absorption peak recorded at 660?nm decreased with the increase of the UV-illumination time while the color of the initial MB solution was drastically waned.

Keywords : Spray pyrolysis method, MoO3 nanofilms, optical properties, Magnetic Properties