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The effect of palladium doping on optical and electrochromic properties of sol-gel deposited tungsten oxide films

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Abstract

In this paper, palladium doped-tungsten oxide thin films have been prepared by sol-gel deposition method. In this way, tungstic acid obtained by Kudo method was doped by different amounts of palladium chloride and were deposited on transparent conductive oxide of ITO/glass by dip-coating method. The effect of Pd doping on morphology and optical properties as well as electrochemical characteristics were investigated using scanning electron microscopic (SEM), UV-Vis spectroscopy, cyclic voltammetry (CV) and optical transmission at 632.8 nm constant wavelength. SEM revealed that the WO₃ layers have a thickness of 450-500 nm were obtained with smooth and uniform surfaces. Also, the transparency of layers was above 85%, for which the optical gap was decreased by increasing Pd content. The voltammetry results showed that the doped palladium reduces the cathodic potential, increases the chemical stability of tungsten oxide thin films, stabilizing the electrochemical performance of these layers. Finally, we measured the electrochromic response time and the corresponding electrochemical efficiencies.

Keywords: palladium, tungsten oxide, sol-gel, electrochromic, SEM

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