

# Structural, Optical and Electrochromic properties of nanocrystalline WO<sub>3</sub> thin films

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## Abstract

In the present work, WO<sub>3</sub> thin films were coated onto well cleaned corning 7059 glass, Silicon and ITO coated glass substrates by electron beam evaporation (EBE) technique under an oxygen partial pressure of  $2 \times 10^{-4}$  mbar by maintaining the substrate temperature at 6-8 °C and room temperature (RT). The deposited films were subsequently annealed at 400 °C in air at about 2 hours and the films were systematically characterised to analyse the electrochromic properties which are useful in emerging chromogenic technology. The structural, morphological, vibrational, optical and electrochromic properties of WO<sub>3</sub> films were studied by XRD, AFM, Raman, UV-VIS spectroscopy and Cyclic voltammetry respectively. XRD studies reveal that the prepared WO<sub>3</sub> films are completely monoclinic structure with different orientations. The AFM images and the grain sizes are comparable with the XRD data. The optical transmission and energy bandgap of the films increases with the lowering of temperatures to 6-8 °C. Finally it is found that, the coloration efficiency at the wavelength of 550 nm for the annealed films deposited at 6-8 °C is maximum 72.60 cm<sup>2</sup>C<sup>-1</sup>.

Keywords: Tungsten trioxide thin films, electron beam evaporation, structure, morphology, optical and electrochromic properties.