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Spectroscopic analysis of temperature dependent growth of WO3 and W0.95Ti0.05O3 thin films YOUNG YUN, FELICIA MANCIU, DURRER WILLIAM, JAMES HOWARD, CHINTALAPALLE RAMANA, OPTICAL SPECTROSCOPY LAB TEAM, DR. RAMANA'S TEAM COLLABORATION — We present a comparative spectroscopic study of the morphology and composition of tungsten oxide WO_3 and $W_{0.95}Ti_{0.05}O_3$ thin films, grown by radio frequency magnetron reactive sputtering at substrate temperatures varied from room temperature (RT) to 500 °C, using Raman and X-ray photoelectron spectroscopy (XPS). The Raman results demonstrate the occurrence of a phase transformation from a monoclinic WO_3 structure to an orthorhombic or tetragonal configuration in the $W_{0.95}Ti_{0.05}O_3$ thin films. This remark is based on the observed shifting, with Ti doping, to lower frequencies of the Raman peaks corresponding to W-O-W stretching modes of WO_3 at 806 and 711 cm^{-1}, to 793 and 690 cm^{-1}, respectively. Also, higher growth temperatures are required to obtain crystalline microstructure for Ti-doped WO_3 films than for WO_3 films. XPS data indicate that the doped material has a reduced WO_{3-x} stoichiometry at the surface, with the presence of W^{+6} and W^{+5} tungsten oxidation states; this observation could also be related to the existence of a different structural phase of this material, corroborating with the Raman measurements.

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