Title:	Facile Synthesis of Pure and Cr-Doped WO3 Thin Films for the Detection of Xylene at Room Temperature
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Keywords:	Deposition Sensors Doping
Issue Date:	2022
Publisher:	ACS Publications
Citation:	ACS Omega, 7(51), 47796-47805.
Abstract:	This paper focused on the preparation of pure and Cr-doped tungsten trioxide (WO3) thin films using the spray pyrolysis method. Different techniques were adopted to analyze these films' structural and morphological properties. The X-ray detection analysis showed that the average crystallite size of the WO3-nanostructured thin films increased as the Cr doping concentration increased. The atomic force microscopy results showed that the root-mean-square roughness of the films increased with Cr doping concentration up to 3 wt % and then decreased. The increased roughness is favorable for gas-sensing applications. Surface morphology and elemental analysis of the films were studied by field emission scanning electron microscopy with energy-dispersive X-ray spectroscopy measurements. The 3 wt % Cr-WO3 has a large nanoflake-like structure with high surface roughness and porous morphology. Gas-sensing characteristics of undoped and Cr-doped WO3 thin films were investigated with various gases at room temperature. The results showed that 3 wt % Cr-doped WO3 film performed the maximum response toward 50 ppm of xylene with excellent selectivity at room temperature. We believe that increased lattice defects, surface morphology, and roughness due to Cr doping in the WO3 crystal matrix might be responsible for increased xylene sensitivity.
Description:	Only IISER Mohali authors are available in the record.
URI:	https://doi.org/10.1021/acsomega.2c05589 (https://doi.org/10.1021/acsomega.2c05589) http://hdl.handle.net/123456789/5039 (http://hdl.handle.net/123456789/5039)
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