Abstract:

This Doctoral thesis mainly focus on the understanding of Aerosol Assisted chemical Vapor Deposition (AACVD) technique and effect of various process parameters on structure, morphologies and optical behavior of metal oxide thin films. Main focus was on gas sensing behavior. Binary and ternary metal oxide thin films of metal oxides have been synthesized and investigated for gas sensing application. AACVD method was used for single step deposition of sensing films onto alumina gas sensor substrate, demonstrating the compatibility between the fabrication process and the sensing nanostructured layer deposition. The fabricated devices were based on pure and Pd-doped WO_3 nanorods and nanoneedles, as well as ZnO, SnO_2 and $ZnSnO_3$ nanostructure. Various characterization techniques, including XRD, FESEM, EDX, RBS, and UV-Vis Spectroscopy were employed to extract the information about their structural, morphological and optical properties. This information helped to understand the characteristics and their effect on gas sensing properties of deposited nanostructured thin films. Gas sensing characterizations of deposited sensors have been carried out using H_2, H_2S, CO and etoch. at operating temperature between 200°C-500°C. Effect of doping on gas sensing behavior as well as comparison between sensor response of binary and ternary metal oxide have been investigated.

This study can be further extended to systematically investigate the effect of various deposition parameters as well as different concentrations of dopant on gas sensor performance of metal oxide based gas sensors.