ABSTRACT

The present work deals with the structural and surface modifications of Sn after microplasma treatment for enhancement of field emission properties. For this purpose Sn was treated with Ar-microplasma at constant applied voltage of 5kv with exposure time from 2 minutes to 12 minutes. The treated Sn samples are characterized using optical and Scanning Electron Microscopy (SEM) analysis, X-ray Diffraction (XRD) analysis and Scanning Kelvin Probe (SKP) method. SEM analysis reveals the formation of craters, pores, cones, ridges, droplets and cavities induced by the microplasma treatment. XRD analysis confirms no new phase formation alnogwith higher angular shifting and shift in peaks intensity is observed. Work function varies from 4.08 eV to 4.84 eV as a function of microplasma exposure time. Field Emission (FE) parameters were evaluated by I-V characteristics and Fowler-Nordheim (F-N) curves using diode configuration. The range of values for the maximum current density (Imax), turn on field (E), and field enhancement factor (β) come out to be in the range of 127 nA/cm^2 to 2440 nA/cm^2, 2.25 V/μm to 7.25 V/μm, and 1413-7460, respectively. The maximum surface structural density (maximum emission sites) are well correlated with current density and β. This research offers valuable insights into the use of microplasma arrays for surface modification of Sn to enhance its field emission properties. The findings provide a basis for further research and development in the field of plasma surface engineering for advanced electronic applications in the field of LCD displays and FE-SEM.