

### **Abstract**

Mass Spectroscopic, surface and structural study of Cesium ion implanted Vanadium Oxide ( $V_xO_y$ ) have been studied in this thesis. The Cesium ions from (SNICS-II) source of 2 MeV Pelletron accelerators are bombarded on the Vanadium Oxide ( $V_xO_y$ ) embedded in the cathode ion source. The Cesium ions energy ranges from 0.2 KeV to 5 KeV by a step size of 0.2 KeV till 0.8 KeV and then by step size of 1 KeV. The Mass Spectrum of  $VO_2$  reveals that there are many compounds present in the sample like: O,  $O_2$ , VO, X,  $VO_2$  and water ( $H_2O$ ). Similarly Mass spectrum of  $V_2O_4$  represents the presence of O,  $O_2$ ,  $VO_3$ ,  $V_2O_4$  and Cs- $O_2$  at different energy ranges. Structural properties are investigated by X-ray diffraction analysis. Crystallite size has been calculated using Debye Scherer formula. The X-ray diffraction patterns of  $VO_2$  and  $V_2O_4$  reveal that by increasing Cs ions energy the material shows amorphous behavior. The Raman spectra show various bond groups which represent various bonds vibration of V-O. Surface morphology is studied by using SEM analysis. The SEM micrographs depict surface degradation by incident ions energy transfer. Unirradiated SEM micrographs show agglomerates for both  $VO_2$  and  $V_2O_4$ . In exposed samples with increase in incident ion energy, needle like structures are observed and hence permanent damage leads to overall degradation of Vanadium Oxide ( $V_xO_y$ ).