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Heavy Ion Beam Induced Sputtering of Thin Film Indium Tin Oxide at MEV SIMS Energies.

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Ion beam induced sputtering in matter is of interest for fundamental ion-atom interaction studies. It is also important for practical applications such as ion beam materials analysis techniques like Secondary Ion Mass Spectrometry at MeV ion energies (MeV SIMS). Theoretical descriptions of nuclear sputtering yields due to keV projectile ions are generally in good agreement with experimental data, but this is not the case for electronic sputtering yields using heavy projectile ions There is thus a need for experimental data to improve existing theoretical models that describe electronic sputtering due to MeV ions. This work presents results of thin film sputtering yield measurements carried out using the Elastic Recoil Detection Analysis technique (ERDA). Measurements were carried out to determine the electronic sputtering yield in Indium Tin Oxide (ITO) due to 29 Cu q+ and 79 Au q+ MeV ion beams at an ion velocity range of 0.1 MeV/u - 0.6 MeV/u. The UV-Vis characterization technique was also used to determine the changes in the optical properties of the conducting oxide films due to heavy-ion beam irradiation. Results show that reduction in thickness of the ITO film is attributed to the preferential sputtering of oxygen from the surface. The measured sputtering yield data were found to decrease with increasing ion fluence in the ITO target material for both Au and Cu ion beams. The optical band gap was found to decrease only slightly from 3.99 eV (for pristine) to 3.93 eV with increasing ion fluence. The results, in general, indicate that heavy ion beams irradiation can be used as an effective tool to induce surface modifications in thin films by dense electronic excitation.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

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