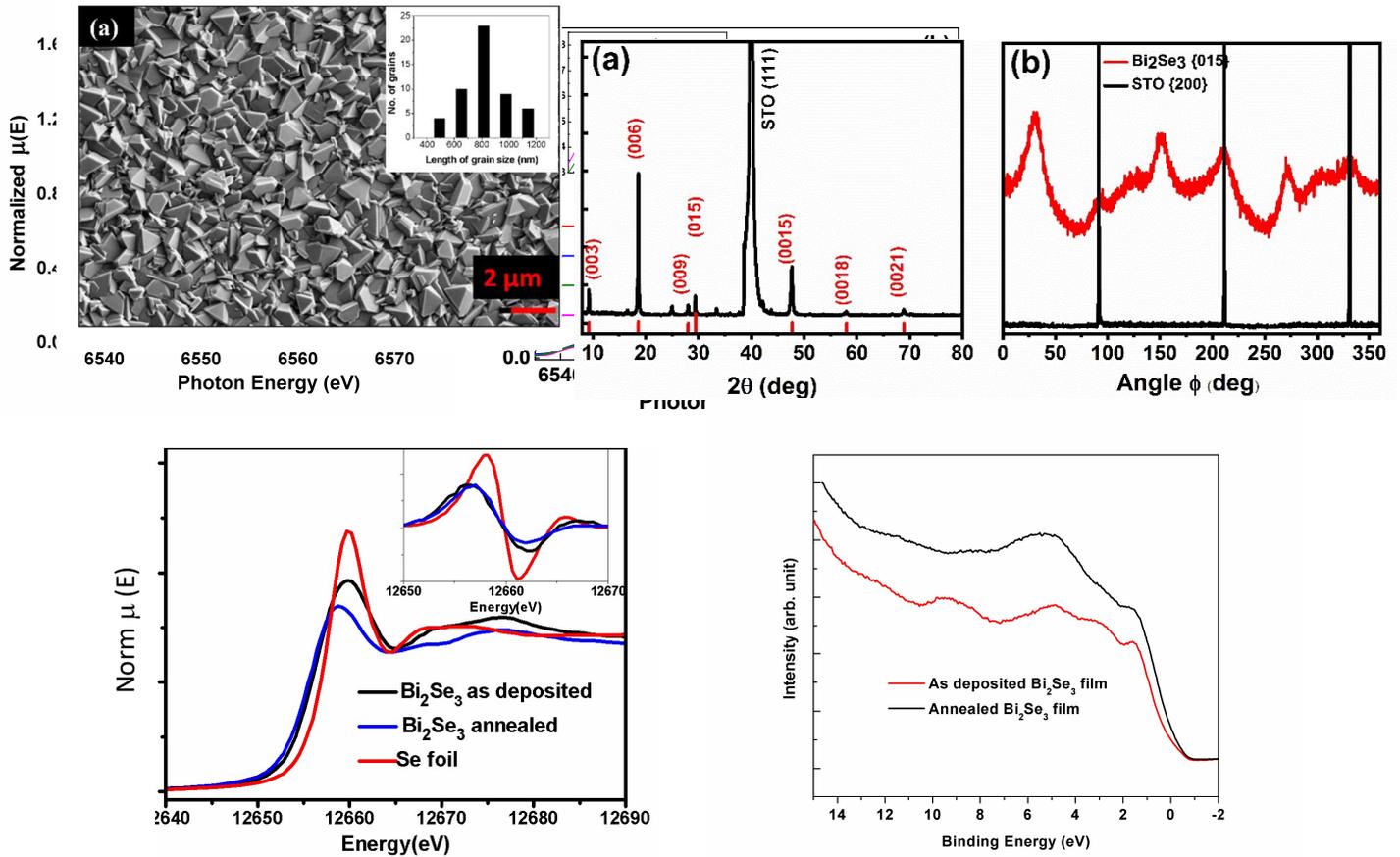


- Growth & characterisation of topological insulator films (2020)



**Topological insulator thin films of Bi<sub>2</sub>Se<sub>3</sub> have been deposited on SrTiO<sub>3</sub> (111) substrate by an in-house developed dc magnetron sputtering system at 425°C and annealed in Se environment at 300°C for 2 hours. EDXS measurements confirm that annealed films are perfectly stoichiometric with an average Bi to Se atomic ratio of 0.68. FESEM micrographs (top panel left) shows large faceted grains of the films with triangular domains. X-ray Diffraction (XRD) measurement (top panel middle) shows (00l) (l=3n, where n is an integer) type of reflections over 2θ range of 10-80° without any other peaks indicating that the films are of single crystalline quality along the [001] growth direction. φ-scan XRD (top panel right) reveals in-plane order of the samples. X-ray absorption near edge structure (XANES) measurement (bottom panel left) establishes -2 oxidation state of Se in the films which is also supported by core level Photo-electron spectroscopy (PES) measurements, while valence band PES spectra (bottom panel right) show significant density of states near the fermi energy (a characteristic of topological insulators) which increases with annealing. Thus the above study confirms that highly c-axis-preferred orientated Bi<sub>2</sub>Se<sub>3</sub> thin films can be obtained by relatively simpler and easily scalable dc magnetron sputtering technique.**