Deposition and structural characterization of Ti/Si thin films

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The Ti films with 50~125nm thicknesses were deposited on silicon substrates in a high vacuum electron beam evaporation chamber interfaced with a thin film deposition controller. The structural and morphological characterization of Ti films were performed using X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), field emission scanning electron microscopy (FESEM) and energy dispersive spectroscopy (EDS). XRD patterns were collected by in-plane, out-of plane and glazing incident measurement techniques. It was revealed that the Ti films have HCP symmetry with strong (002) preferred orientation along their surface normal, having lattice parameter a=2.951±0.003 Å, c=4.82±0.01 Å. The presence of metallic Ti was also confirmed by XPS analysis. FESEM images showed that the finite sized grains were homogeneously grown on the surface. The film surface/interface roughness and layer density were studied by X-ray reflectivity method.