Elaboration and characterization of silicides of rares earths and transition metals

Abstract

The present work deals with the elaboration and characterization of nanometric thin layers of binary and ternary transition metals and rare earth silicides. The binary system samples were obtained by implantation of yttrium ions at room temperature (RT), with a dose of 2x $10^{17}Y^{+}$ / cm^2 and an energy equal to 195keV in a P-type Si (111) substrate , followed by thermal annealing at 600 ° C, 800 ° C and 1000 ° C for 1 hour. Ternary silicide layers Ni/Y/Si constituting the second series of samples, were formed by ion implantation at room temperature of yttrium ions into a Si(1 11) substrate with a dose of 8 x 10^{16} Y^{+}/cm^2 and an energy equal to 200 keV, followed by deposition the thin films of nickel at room temperature by magnetron sputtering. Then, these samples annealed under vacuum at temperatures varied between 150-400 °C for 1h. X- ray diffraction (XRD), Rutherford backscattering spectroscopy (RBS), Raman Spectroscopy, Scanning Electron Microscopy (SEM) and the Atomic Force Microscopy (AFM) are the experimental techniques employed for samples characterization. For the Y/Si system the results show that the yttrium silicide layers YSi_{2-x} form and grown on the Si in a polycrystalline structure independently of the annealing temperature. All samples show qualitatively very similar intensity distributions. For the Ni/Y/Si(111) system, the study highlighted the formation of several binary and ternary silicides reflecting the reaction in the solid state at the interface of the Ni/Y/Si system.

Key Words : Rare earth, yttrium silicide, interface, IBS, XRD, RBS, SEM, AFM.