Etude de la diffusion dans le système Ni/Si et Ni/Au/Si

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Abstract:

The purpose of our study here concerns the effect of an Au (gold) buffer on the formation of Ni silicides in the thin film system Ni (1250 Å)/Au (750 Å)/Si (111). The work on this case consisted on the deposition of Ni thin film on Au thin film deposited on Si(111) substrate by PVD technique. Before this, and in the purpose to study the Ni(1250 Å)/Si interface stability as a function of temperature, we have deposited Nickel thin films on monocrystalline silica substrate with (111), orientations. All these samples underwent a heat treatment at temperatures of 200, 300, 350, 400, 600, 750, 800° C. The X-ray diffraction (XRD), and the four point probe techniques have been used to investigate the structural and electrical properties of these thin films as a function of the heating temperature.

In the Ni/Si Systems, it was found that the $\text{Ni}_2\text{Si}$, $\text{NiSi}$ and $\text{NiSi}_2$ silicides are formed sequentially with raising temperature. We also found that the presence of a gold (Au) thin film affected these properties drastically; $\text{Ni}_2\text{Si}$ and $\text{NiSi}$ appear simultaneously and the nucleation temperature of $\text{NiSi}_2$ is lowered for this later case.

Four-probe measurements showed that the presence of Au increases the sheet resistance for Ni/Au/Si(111). In the Ni/Au/Si systems the most resistive phase, $\text{NiSi}_2$ appears around the 600° C heating while it appears at 800°C for the Ni/Si System. Finally we remind that there is no Au-Si compound formation and the solubility of Au in Si is very limited.

REFERENCES: