

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

*N. Menni, F. Zekkar, R. Louahdi, M. Boudissa,*  
ENMC Laboratory, University F. Abbas Setif ALGERIA

**Email : [nacermenni@yahoo.fr](mailto:nacermenni@yahoo.fr)**

### **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 Ni<sub>2</sub>Si, NiSi and NiSi<sub>2</sub> silicides are formed sequentially with raising temperature. We also found that the presence of a gold (Au) thin film affected these properties drastically: Ni<sub>2</sub>Si and NiSi appear simultaneously and the nucleation temperature of NiSi<sub>2</sub> 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, NiSi<sub>2</sub> 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:**

- [1] K.N.Tu, J.W.Mayer, "Thin film interdiffusion and reaction", Ed Wiley-Interscience, NewYork, chap10, p359, 1978.
- [2] K. MAEX, M.VON ROSSUM, Properties of Metal Silicides. EMIS Data Reviews. Vol. 14, INSPEC, 1995.
- [3] F.M. D'HEURELE, P. GAS. "Kinetics of formation of silicides". Journal of Material Research, vol. 1, p.261, 1986.
- [4] P. GAS, F.M. D'HEURLE, F.K. LEGOUES, "Formation of intermediate phases, Ni<sub>3</sub>Si<sub>2</sub> and Pt<sub>6</sub>Si<sub>5</sub>: Nucleation, identification, and resistivity". Journal of Applied Physics, Vol. 59, n°10, 1986.
- [5] M.A.Nicolet, S.S. Lau, VLSI Electronic Microstructure science, Ed G.Einspien. B.Larraee, Academic Press New York, p330. (1983).
- [6] R. ANDERSON, J.BAGLIN., J.DEMPSEY, et al. « Nucleation controlled thin-film Interactions: Some silicides". Applied Physic letters, Vol. 35, n°3, p.285, 1979.