

# **Mechanical properties of silicon nitride prepared by plasma enhanced chemical vapor deposition at low temperature as a function of dc bias voltage**

**Thuy T. T. Pham, J. H. Lee, I. K. Kim and G. Y. Yeom**

Dept. of advanced materials sciences and engineering, sungkyunkwan university

Silicon nitride ( $\text{SiN}_x$ ) is a widely material in various technologies. For the fabrication of microelectronic devices, both passivation layers and gate dielectrics are the main uses of  $\text{SiN}_x$  films because of the good properties such as low cost, good barrier, chemical inertness, good-dielectric, high thermal stability and applicability of improving the efficiency operation OTFTs devices. However, depositing at low temperature makes to limit the application of thin films in that fabrication as same as reduces the mechanical and chemical properties.

In this study, mechanical properties of  $\text{SiN}_x$  films - as dielectric layer for OTFTs, have been evaluated respectively by hardness, stress and roughness properties. An analysis of the films was carry out using nanoindenter, stress induced curvature and atomic force microscope (AFM) - none contact mode measurement. Thin films were deposited by changing d.c. bias voltage ( $V_b$ ) from 0 to -200 V plasma enhanced chemical vapor deposition (PECVD) at low temperature (under 80  $^{\circ}\text{C}$ ). The general dependence of  $\text{SiN}_x$  hardness on PECVD  $V_b$  is observed and the stress of the films shows a compressive stress as a function of  $V_b$ . At low temperature, the morphology of thin film surface which is measured by AFM dedicated that temperature processing plays an important role in passing oxidation which happen between sample and environment at low temperature and controlling of quality surface by choosing suitable  $V_b$ .