

## **Influence of Deposition Parameters on Film Hardness for Newly Synthesized BON Thin Film by Low Frequency R. F. PEMOCVD**

G. C. Chen, J. -H. Boo, Y. J. Kim, and J. G. Han

Center for Advanced Plasma Surface Technology, Sungkyunkwan University, Suwon 440-746, Korea

### **Abstract**

Boron-containing materials have several excellent properties, such as superhardness, insulation and non-linear optical property. Recently, oxynitride compounds, such as Si(ON), Ti(ON), became the promising materials applied in diffusion barrier layer and solar cell. With the expectation of obtaining the hybrid property, we have firstly grown the BON thin film by radio frequency (R.F.) plasma enhanced metalorganic chemical vapor deposition (PEMOCVD) with 100 kHz frequency and trimethyl borate precursor. The plasma source gases used in this study were Ar and H<sub>2</sub>, and two kinds of nitrogen source gases, N<sub>2</sub> and NH<sub>3</sub>, were also employed. The as-grown films were characterized by XPS, IR, SEM and Knoop microhardness tester. The relationship between the films hardness and the growth rate indicated that the hardness of the film was dependent on several factors such as nitrogen source gas, substrate temperature and film thickness due to the variation of the composition and the structure of the film. Both nitrogen and carbon content could raise the film hardness, on which nitrogen content did stronger effect than carbon. The smooth morphology and continuous structure was benefit of obtaining high hardness. The maximum hardness of BON film was about 10 GPa.