An infrared spectroscopic study on deposition process of amorphous carbon films using Benzene as a source molecule

Y. Taniguchi, M. Shinohara, Y. Matsuda, H. Fujiyama

Nagasaki University, 1-14 Bunkyo Nagasaki 852-8521, Japan

e-mail: sinohara@nagasaki-u.ac.jp

Amorphous carbon films have attractive for various industrial applications, because the films have a lot of properties, such as hardness, smoothing surface, chemical stable and so on. The films can be deposited at room temperature with plasma process. The films can be deposited on various shapes of materials with plasma enhanced chemical vapor deposition (PECVD). Various hydrocarbon molecules are used as source materials with PECVD. Benzene is one of the promising source materials. However, the deposition process using benzene plasma has not been fully understood.

We used infrared absorption spectroscopy in multiple internal reflection geometry (MIR-IRAS) to investigate the deposition process due to benzene plasma. This technique can be applied to an “in-situ” and “real-time” measurement of the deposition process.

We can observe the CH peak of benzene molecules from the low plasma exposure region. The peak due to of the CH peak and that due to the C=C bonds are also increasing at a high rate with the exposure, in a comparison with the increasing rates of the CH peak of benzene molecules. These peaks are generated due to the cleavage of benzene molecules. It means that the amorphous carbon film deposited with benzene plasma contains benzene rings in the initial stage and that the benzene rings are destroyed by the long plasma exposure.

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