Effect of silicon content in diamond-like carbon film deposited by magnetron sputtering

Yuki Miwa [1], Akinori Oda [2], Hiroyuki Kousaka [3], and Takayuki Ohta [1]

[1]Meijo Univ., Japan

[2]Chiba Inst. of Tech., Japan

[3]Gifu Univ., Japan

Diamond-Like Carbon (DLC) film has been attracted attention as a surface coating material due to some good properties such as high hardness, low friction, high chemical stability and so on. The silicon-doped DLC (Si-DLC) films, which have been deposited by plasma-enhanced chemical vapor deposition, exhibits low friction coefficient less than 0.1. On the other hand, a hydrogen-free DLC film, which is deposited by the physical vapor deposition (PVD) method, can also reduce the friction coefficient.

In this study, the Si-DLC film was deposited by a dual magnetron sputtering method using Si and C targets to reduce the friction coefficient. The mechanical and structural properties of the DLC film were investigated by varying the percentage of silicon.

A DC power source and RF power source were connected to the carbon and silicon targets, respectively. The flow rate of Ar gas was 100sccm and the total pressure was 0.5Pa. Substrate bias voltage was -100V, and the distance between the target and the substrate was 84mm. The ball-on-disc test was performed to determine the friction coefficient.

Si amount in the DLC film was increased with increasing RF power from 0 to 30W at DC voltage of 550V, resulting that the disorder component in the DLC film increases from the results of Raman scattering spectroscopy. The friction coefficient decreased to be 0.078 with increasing RF power up to 20W and the Si-DLC film was worn off by the ball-on-disc test more than RF power of 20W.