

PO3059

A study on the effects of the CF₄ Treatment on the properties of DLC films deposited by PECVDJun Hyung Kim¹, Duck Hyeong Jung¹, Kyoung Il Moon¹, Cheol Woong Byun¹¹Korea Institute of Industrial Technology, Incheon, South Korea

kimamz@kitech.re.kr

DLC films have been applied to diverse industrial fields because of good tribological properties like high hardness, low friction coefficient and chemical stability etc. They have found applications in tribology, mechanics, electronics, biomedicine and even the arts. However, DLC has the weakness of high temperature instability and could have bad friction coefficient in moisture, some oil, and even react with solder materials. So in this study, DLC film was post-treated with CF₄ gas to increase the hydrophobic property and the lubrication ability. In this study, DLC films were deposited by PECVD process with C₂H₂ and Ar gases after the deposition of Si interlayer. And then, to improve hydrophobic properties of DLC films, they were treated by CF₄ + Ar+C₂H₂ gases. The structure of DLC films was confirmed by Raman and the hydrogen contents in the DLC films were measured by RBS and ERD analysis. In additions, the mechanical properties of DLC films were analyzed by scratch tester for adhesion, nano-indenter for hardness and Tribo-meter for wear properties including friction coefficient. From Raman analysis, DLC films had traditional structure properties regardless of CF₄ treatment. It showed higher intensity of G-peak as the amount of CF₄ increased in the process. This results in the brittle surface layer by weak adhesion of F element. According to nano-indentation test, it was shown that the hardness varied from 21.4 Gpa to 18.2 Gpa with decreasing amount of CF₄. In additions, the adhesion force increased by forming an optimal Si interlayer, and it increased from 25N without Si interlayer to 30N. This is a much superior adhesion force for PECVD DLC films compared with conventional results and it could be applied for automobile parts. However, the addition of fluorine caused the decrease of adhesion force to 20N. After the DLC films were treated by CF₄ + Ar plasma treatment, the enhancement of tribological properties of DLC films was found out in this study. Also, with increase of CF₄, a contact angle rose from 69° to 126° and It is found out the superior corrosion resistance in high contact angle film.

Keywords

Diamond like carbon coating

CF₄ gas

Lubrication