

플라즈마 증착방식에 의해 DLC코팅된 알루미나 세라믹의  
코팅박막 특성에 관한 연구

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**CHARACTERISTICS OF DIAMONDLIKE CARBON COATED ALUMINA SEALS AT  
TEMPERATURES UP TO 400 °C**

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**Abstract :** Diamondlike carbon (DLC) coatings were deposited on alumina ceramic seals using a plasma immersion ion deposition technique (PIID). Then they were subjected to tribological tests using a pin-on-disc tribometer under a high load (1.3 GPa) and under elevated temperatures up to 400 C. Coefficients of friction (COFs) were recorded and compared with that of the untreated alumina while the wear tracks were analyzed using SEM with EDSto characterize the DLC films. To enhance the DLC adhesion to the substrate, various interlayers including Si and Cr were deposited using the PIID process or an ion beam assisted deposition (IBAD) method. It was observed that the DLC coating, if adhering well to the substrate, reduced the COFs significantly, from 0.4-0.8 for the uncoated alumina to about 0.05-0.1, within the tested temperature range. The adhesion was determined by the interlayer type and possibly by the application method. Cr interlayer did not perform as well as the Si interlayer. This could also be due to the fact that the Cr interlayer and the subsequent DLC coating had to be done in two different processing systems, while both the Si interlayer and the subsequent DLC film were deposited in one system without breaking the chamber. The coating failure mode was found to be delamination between the Cr and the alumina substrate. In contrast, the Si interlayer with proper DLC deposition procedures resulted in very good adhesion and hence excellent tribological performance. Further study may lead to future DLC applications of ceramic seals.

**Key Words :** Diamondlike carbon, plasma immersion ion deposition technique, Coefficients of friction,  
ion beam assisted deposition