

Recent Advances in Diamond-Like Carbon Films in the Medical and Food Packing Fields

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Diamond-like carbon (DLC) films have been widely used for many applications due to their outstanding properties such as high hardness, chemical inertness, and high electrical resistivity. The mechanical properties of DLC fall between those of graphite and diamond; the material possesses low-friction coefficient, low wear rate, high hardness, excellent tribological properties, and good corrosion resistance. DLC is an excellent candidate for use as biocompatible coatings on biomedical implants, which is due to not only its excellent properties but also its chemical composition containing only carbon and hydrogen, which are biologically compatible with human cells. In our laboratory, we have developed fluorinated DLC film (F-DLC) by combining the advantages of fluorine doping with conventional DLC characteristics and evaluated its biocompatibility as a surface coating for human blood-contacting devices in the medical field. We present an overview of DLC and F-DLC coatings for medical devices and our data regarding the biocompatibility of F-DLC coatings. In addition, we have developed a possible application of DLC films with high-gas-barrier properties for food and beverage containers, especially for PET bottles. We have recently developed a unique and cost-effective atmospheric-pressure glow plasma-enhanced chemical vapor deposition (CVD) technique as a substitute for the low-pressure CVD technique. This technique has the potential to become the next-generation technique for the film-coating industry.

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