Evaluation of anti-corrosion properties of DLC coatings for medical devices

ABSTRACT

Biomaterials are now widely being used as coatings over different medical implants and devices to prevent the implants and medical devices from the environment they interact with; to be precise the coatings prohibit any unwanted biocompatibility issue. A research was carried out on stainless steel disks that commonly become the very foundation of the medical implants such as artificial hip bones or other plates that are used invasively for fixation of fracture. For the purpose of coating Diamond-Like Carbon (DLC) coating was used because they can be coated on wide range of materials that include: metals, ceramics, glasses and plastics. The DLC coatings exhibit low friction, wear resistance, corrosion resistance and biocompatible properties. The DLC coatings when combined with different elements can be tempered as per required. Diamond-Like Carbon (DLC) coatings with various Silicon and Fluorine content were deposited on 10mm 316L Stainless Steel disks. The samples were investigated for their surface energies and their corrosion resistance. The corrosion resistance behavior was tested in 4 different testing solutions, which were the Phosphate Buffer Saline, 3.5% NaCl and two different concentrations of HCl. To test the surface energies, contact angle measurement was adopted and the result showed significant decrease in the total surface energy for the Fluorinated coatings. While potentio-dynamic polarization test method were performed for testing the corrosion resistance properties of the samples. The corrosion rates revealed that 20.7% F-DLC coating had promising results which was showing the best corrosion resistance; also the 19.7% Si-doped DLC had the best corrosion resistance in its class.

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