

Characteristics of plasma polymerization films using HMDSO precursor on 316L stainless steel

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Abstract

This study focused on the characterization of the organic film deposited on 316L stainless steel substrate using a plasma polymerization process with hexamethyldisiloxane (HMDSO) precursor. The organic films were fabricated under different HMDSO-O₂ gas ratios and the heating temperature of the monomer. The plasma characteristics during the plasma polymerization process were studied by an optical emission spectrometer. The structure and bonding of the deposited films were analyzed by a Fourier Transform Infrared Spectroscopy (FTIR). The scratch test was employed to evaluate the adhesion properties of coatings. Preliminary biocompatibility studies were carried out using MG-63 cell line (human osteosarcoma) to investigate cell-material interaction. The results of cell viability and toxicity are presented.

It can be found that the plasma polymerization grown films were free of pinholes and showed an excellent adhesion quality to the substrate. Good biocompatibility was also observed for the organic coating. Effects of HMDSO-O₂ gas ratio and the heating temperature of the monomer on the plasma status, structure, film thickness, mechanical property and biocompatibility of the films deposited on 316L stainless steel substrate were further discussed in this work.

Keywords: *plasma polymerization, HMDSO precursor, 316L stainless steel, optical emission spectrometer, FTIR, adhesion, biocompatibility*