Influence of high frequency and moderate energy pulses on DLC deposition onto metallic substrates by magnetron s puttering technique

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The deposition of Diamond-like carbon (DLC) films brings excellent mechanical, chemical, optical and electronic properties to a large range of materials. However, a problem to be overcome is its poor adhesion on metallic substrates. Usually, a silicon layer must be deposited on the surface of metals previous to DLC film deposition. In fact, in our experiments using conventional Magnetron Sputtering (MS) technique for deposition of DLC film on metal surfaces (AISI 304 stainless steel, Al 2024, Ti-6Al-4V), the silicon interlayer was crucial to avoid delamination. However, a combined process using MS and high frequency and moderate energy pulses (2.5kV/6μs/1.25 kHz), was successful to grow DLC film without the interlayer. Additionally, by monitoring the stress and the thickness in silicon samples after the processes, it was possible to correlate the conditions of operation with such charact eristics. Stress measurements carried out by a profilometer and calculated by Stoney´s equation varied from 2 GPa to 10.5 GPa depending on the conditions of operation of the process (pressure, distance source-substrate, frequency, length and intensity of the pulse). The thickness, the composition, the structure and the morphology of DLC coatings deposited in such metallic surfaces were obtained. Tribological and corrosion tests were also performed.

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