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ABSTRACT:

New Features of PECVD Technique for DLC growth and CVD Diamond Growth and Its Perspective for Many Application

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Plasma discharge for DLC films and CVD Diamond growth have been in evidence by scientific and technological studies due to their demand in terms of scientific research and a lot of applications. More specifically, the DLC films with its superior properties such as: low coefficient of friction, high chemical inertness, high hardness, high wear resistance, biocompatibility, bactericide, etc., and CVD Diamond, also with its set of properties that qualifies it for many applications in the near future. For both materials, DLC films and CVD Diamond, plasma discharge plays an important role in terms of its properties, ease of production, low costs, aiming at different applications. It is so apparent that by varying the discharge characteristics, such as ion density, pressure, temperature, gaseous components, etc., it becomes possible to control the properties of these materials, i.e., both DLC and CVD Diamond films.

So, in this work, a summary of the best plasma conditions for growing DLC films, on substrates of different materials, from metals to polymers, at lower temperatures in a non-collision regime using the PECVD (Plasma Enhanced Chemical Vapor Deposition) technique is presented. This technique was modified with an Ion Confinement System, providing lower coefficient of friction, lower stress, higher hardness and especially greater adhesion on metallic and nonmetallic substrates. For the DLC films obtained, we will show that a cold plasma allows a large variation of its parameters for different applications. Also, in this presentation, we will show how to get single crystal CVD Diamond by using a high power PAMWCVD (Plasma Assisted Microwave Chemical Vapor Deposition) technique. Pure and doped CVD diamond for many applications, such as jewelry, nuclear batteries, quantum computer, etc., will be presented. In this case, optical and nuclear techniques of characterization will be used in order to find impurities, controlled doping, dislocation, etc., in its structure.