LabPSL

PREPARATION OF NANOCOMPOSITES USING EXCIMER LASER DEPOSITION

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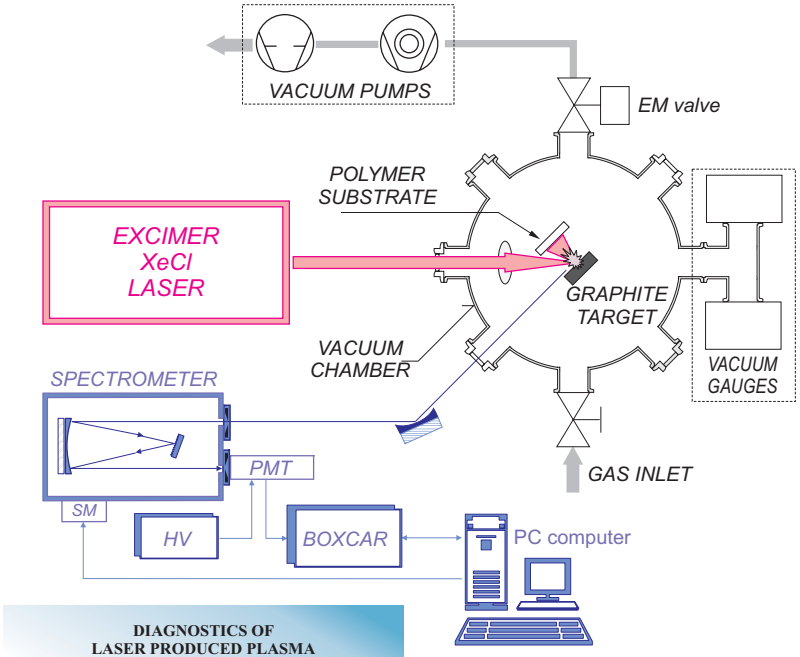
The initial experimental setup for the laser deposition of carbon on thin polymer films was described. The pulsed beam of XeCl laser (l = 308 nm, energy of 150 mJ and a 50 Hz repetition) was incident on the of graphite target at a 45° angle. The laser beam evaporates the surface of the target and the products are deposed on a thin polymer substrate of ethylene vinyl acetate (EVA) copolymer placed at a distance of 5 cm parallel to the target. The whole system was taken under vacuum (base pressure ~ 10-5 Torr). The SEM analysis of the surface of polymer films suggests that further improvement of the apparatus will make possible a realization of nanocomposite structures.

POLYMERS: Semiconductor-polymer nanocomposites are currently the subject of intensive investigation because of their potential application as high-technology materials. Generally, this type of nanomaterials exploits excellent optical and magnetic properties of nanoparticles (or nanowires), which can be designed to scale with and depend on their size. Introduction of nanoparticles into polymer matrixes, which can be processed in various bulk shapes and usually exhibit long-term dimensional stability, produces nanocomposite structures with unique function and utility. So far, several devices have been developed on the basis of these nanostructures, such as: light emitting diodes, photodiodes, photovoltaic solar cells and gas sensors.



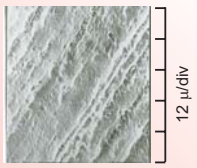
DIAGNOSTICS OF LASER PRODUCED PLASMA

LASER DEPOSITION

Recently, number of physical methods has been developed for preparation of polymer nano-composites. In this paper we present experimental setup for preparation of these nano-structures by laser deposition method.

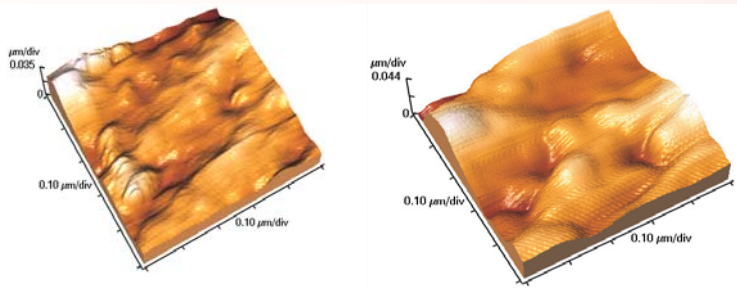
Carbon - polymer composite was chosen as a model material. It is obtained using graphite target and thin film of ethylene vinyl acetate copolymer (EVA) as a substrate.

SEM micrograph of EVA copolimer surface after carbon deposition



Morphology of polymer after laser deposition of carbon. Deposited carbon makes polymer surface conductive and enables SEM analysis of surface structure. Also, we can indirectly conclude that the carbon layer posses a small grain structure with a grain diameter bellow 50 nm.

SPM micrograph of EVA copolimer surface after carbon deposition



After deposition SPM micrograph shows craters on the polymer surface, which originate from the impact of carbon particles. Several experiments for determination of degree of diffusion and dispersion of particles inside material are currently in progress.