Nanostructured surfaces

Dependence of the structural and electro-physical properties of the PECVD diamond coatings on the precursor gas mixture

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The influence of the gas-precursor mixture content on structural and electro-physical characteristics of diamond coatings (polycrystalline diamond films) was investigated using Raman scattering spectroscopy, atomic force and scanning electron microscopies, resistivity measurements. The studied samples were prepared using the plasma enhanced chemical vapor deposition (PECVD) technique. In this method, direct current glow discharge in the crossed E/H fields was used to activate the gas phase. The diamond coatings were deposited from the operation mixture CH_4/H_2 with addition of argon and nitrogen in various concentrations. It was ascertained that addition of Ar and N_2 to the operation gas mixture leads to reduction in the sizes of diamond grains as well as to the substantial decrease in the resistivity of the studied films. The dependence of the resistivity on the concentration of N_2 has a monotonic character. The electro-physical data are in good agreement with the changes induced by varying the Ar and N_2 content in the Raman scattering spectra. The increase in the N_2 concentration causes significant lowering the crystalline diamond related peak and increase in the intensity of the peaks related to the sp^2-bonded carbon, see figure.