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INFLUENCE OF HUMIDITY ON THE ELECTROPHYSICAL PROPERTIES AND CHARGE TRANSFER MECHANISM IN NANOSCALE DLC COATINGS

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The investigation of nanoscale diamond-like carbon (*DLC*) coatings on acrylonitrile butadiene styrene plastic (*ABS*) substrates revealed a linear *I-V* characteristic, a decrease of resistivity from 12 μOm·m to 3 μOm·m, and of wetting angle from 52° to 38° with increasing thickness from 54 nm to 71 nm. The relative dielectric permittivity of the *DLC* coatings varies from 5.6 to 6.5, and at the high frequency limit is completely determined by the real part. It is proposed to consider the conductivity in the system "*DLC*-coating//adsorbed layer of H_2O molecules" as a combination of two mechanisms: the hopping conductivity of electrons in the volume of the *DLC*-coating and the proton conductivity by the Grotthuss mechanism in the adsorption layer of water molecules. It is experimentally established that the variation of air humidity in the range of 16% to 95% leads to a decrease in the resistance of the system up to 10^3 times. The results demonstrate the potential for developing a humidity sensor based on a *DLC*-coating with a thickness of approximately 50 nm. This technology will be applied in the fabrication of *GEM*-detectors with optimized resistive coating of the collector electrode.

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