

Impedance of Onion Like Carbon Polymer Composites in the Radio Frequency Band

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Onion Like Carbon (OLC) is aggregates of enclosed fullerene-like spheres, which are produced by annealing of nanodiamonds in a vacuum [1]. OLC is considered as a promising material for absorption of electromagnetic waves in wide-frequency range [2].

For technical application it is necessary developing composite materials with OLC. Composites from conductive OLC [3] embedded into dielectric matrix can absorb the electromagnetic (EM) waves in the range varied from microwave to ultraviolet frequencies and at the same time they are transparent (dielectric) in the radio-frequency range.

With developing of nanocomposites it is very important to uniformly distribute the nanoparticles in a matrix. One of the ways for characterization of homogeneity of the obtained material could be a measurement of the real and imaginary part of its impedance in the radio-frequency range. In the present work we show the results of measurements of impedance for composite samples produced from polystyrene with inclusion mass fraction OLC varied from 1 to 40 wt.%. The OLC sample has been produced by annealing of detonation nanodiamonds at 21000°C. The composite films were made by the forge-rolling method with optimal rolling steps determined for this type of the samples.

It was shown that for composites with low inclusion mass fraction (<20 wt.%) the measurements well agree with the Maxwell-Garnet model. The percolation threshold for the OLC- polystyrene composites was estimated to begin from 35 wt.%.

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- [2] Kuznetsov V.L., et al. Attenuation of Electromagnetic Waves in Onion-Like Carbon Composites , 17th European Conference on Diamond, Diamond-Like Materials, Carbon Nanotubes, and Nitrides, September 3-8, Estoril, Portugal., (2006).
- [3] Kuznetsov V.L., et al Electrical resistivity of graphitized ultra-dispersed diamond and onion-like carbon, *Chemical Physics Letters*, (2001).