Micro- and nanocarbon based composite materials for high frequency polarizer and selective energy transfer applications

Dzmitry Bychanok[1], Sergey Maksimenko[1], Polina Kuzhir[1], M.Kanygin[2], A. Okotrub[2]

[1]Research Institute for Nuclear Problems of Belarusian State University, Belarus

[2]Nikolaev Institute of Inorganic Chemistry SB RAS, Russia

e-mail: dzmitrybychanok@ya.ru

Results of measurements of electromagnetic response of various composite materials containing predominantly oriented cylindrical carbon inclusions (multiwall carbon nanotubes, carbon fibers) in microwave (26-37 GHz) and terahertz (0.5-3.5 THz) frequency ranges are presented.

The theoretical model describing electromagnetic response of materials containing predominantly oriented cylindrical conductive inclusions is proposed. The modelling allows to predict, control and tune anisotropy of electromagnetic properties of such materials in both microwave and terahertz frequency ranges.

The experimentally measured anisotropy of electromagnetic response of materials based on oriented carbon fibers in microwave range demonstrates their significant potential for selective energy transfer and high frequency radiation polarizer applications. Obtained results related to carbon fibers are compared with experimental data of anisotropic electromagnetic response of composites based on predominantly oriented multiwall carbon nanotubes in microwave and terahertz frequency ranges. The possible ways to improve the electromagnetic parameters of carbon based polarizers are analysed.