STUDY OF SMALL-ANGLE NEUTRON SCATTERING IN CARBON FIBERS MODIFIED WITH BOEHMITE AND MAGNETIC PARTICLES

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Application of polyacrylonitrile (PAN) derived carbon fibers (CFs), are of great interest in the field of design and construction of supercapacitors, adsorption of volatile organic compounds, storage and separation of gasses, due to their developed micro-porosity and high specific surface area. Their high mechanical properties in combination with strength-to-weight ratio, allows to use them in the aerospace, defense and energy industries, as well as in other engineering and construction industries [1, 2]. Moreover, the inert nature of carbon fiber, along with the above-mentioned properties, creates favorable conditions for its use in medical purposes.

The complexity of the carbon fiber structure is due to the multistage chemical and structural transformations occurring in the PAN-precursor during the stages of thermostabilization and carbonization. Therefore, its investigation involves multiple characteristic length scales that require specific techniques, for example, from spectroscopic techniques for probing molecular or atomic structures, X-ray diffraction for identifying crystalline or amorphous domains, or both optical and electron microscopy [3].

The microstructure of three types of PAN carbon fibers – virgin, recycled, and functionalized with nitric acid was investigated using the small-angle X-ray scattering (SAXS), and characteristic sizes of elongated nano-objects – fibrils for each type of carbon fiber and features of their surfaces and distribution inside the fiber were determined [3].

This work presents preliminary results of small-angle neutron scattering (SANS) studies of the structure of carbon fibers modified with boehmite and magnetic particles [4, 5], with the aim of obtaining hybrid fillers for polymer-based composite materials.

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