Physico-chemical nanomaterials science

The surface response of brominated carbon media on laser and thermal excitation

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Nanosized graphenes and related carbons, including such nm constituents that having opened edges and adopting a nonbonding π-electron state, are of special interest for nanoscientists and engineers. At the degenerate point between the graphitic π- and π*-bands, edge states play a role of the electron reservoir. So, population of the state of edge origin can cause exceptional influence on electro-optic/magnetic properties. The bromination effects on the properties of so-called nonporous carbons in the simplest way, through the downshift of the Fermi energy. In general, materials with a flexible 3-D random disordered network can be involved in the production of nanoscaled carbons interfaces (NCI) for optoelectronic, spintronics and beyond. For the uncovering of the bromination rules we selected activated carbon fibers (ACFs) as a model, since this carbon disordered networks are formed by graphite-like domains, consist of a few stacked nanographene layers (NGL). A possible surface response for Br grafting one can examine with fast-and-continuous methods. That is why, the present studies are directed on a search for a certain analytical response of the surface with the optical diagnostics and thermal desorption. TG, XPS and TPD-MS results reveal that the interaction between ACFs and the adsorbed bromine passes via covalent bonding and physisorption interactions. Accommodated into the nm scaled pores physisorbed Br_2 induces the charging and structural effects. Surprisingly, the chemisorption with formation of covalent C–Br bonding passes only at the edges of NGL. Studies of elastic light scattering indicatrices under irradiation of CW DPSS laser at 1064 nm, show correlation with the bromination level for i) the scattered signal in a backward hemisphere, within scattering angles range of 145–175°, and ii) readout of the physi- and chemisorbed bromine contribution manifestation. The proposed optical and thermal diagnostics one can use for the surface characterization of related brominated ACFs.