

Analysis of changes in the allotropic species of carbon under plasma exposure by x-ray photoelectron spectroscopy

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Carbon and carbon-containing materials are widely used in modern scientific research. Carbon-containing coatings have a number of important and useful structural characteristics. Corrosion of carbon parts of a fusion reactor under the influence of thermonuclear plasma leads to hydrocarbon coatings (the so-called “tritium problem”). Carbon exists in a large variety of allotropic species determined by hybridization of carbon bonds. As known, physical, chemical and structural features of a material strongly depend on the allotropic species of carbon. The proton and electron energy losses are different in different allotropic forms of carbon.

In the present work, examples of identification of samples of carbon-containing materials by the energy loss region in the x-ray photoelectron spectra are considered. The analysis of different allotropic varieties of carbon is carried out on the basis of the study of a wide area of photoelectron energy loss adjacent to the 1s line of carbon (photoelectron spectroscopy (PES) method). Diamond-like samples, reduced graphene oxide samples, MPG-8 graphite samples subjected to plasma treatment at the PLM facility in the MPEI and highly oriented pyrolytic graphite were analyzed.

This study was financially supported by the Ministry of Science and Higher Education of the Russian Federation (project No.FSWF-2023-0016).