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Final Programme & Abstracts

O-12

X-Ray Photoelectron Spectroscopy of Activated Carbon Fibers Treated with Chlorine

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The results of X-ray photoelectron spectroscopy (XPS) study of the activated carbon fibers (ACF) processed with chlorine are presented in the paper. Initial carbon fibers have been prepared from the PAN-fibers activated with water vapour. According to the data of X-ray diffraction ACFs consist of nanometric graphite particles and some amount of aliphatic fragments. Elimination of these fragments has been performed by high vacuum evacuation at temperature ≈ 800 °C. Later on the samples were placed in the atmosphere of gaseous chlorine for some hours.

The XPS spectra for C1s-electrons of initial ACF and spectra for C1s- and Cl2p-electrons after the fibers treatment with chlorine are presented in Fig.1.

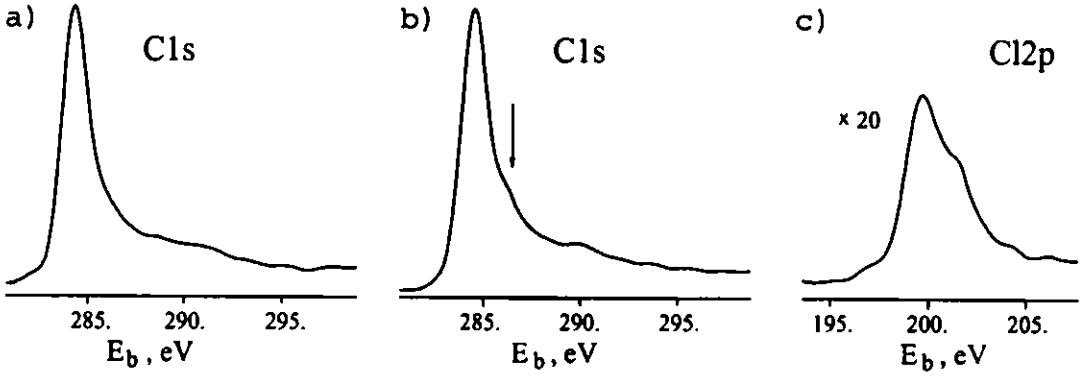

Fig.1. The XPS spectra (after smoothing) for C1s-electrons of initial ACF (a), and spectra for C1s- (b) and Cl2p-electrons (c) after the fibers treatment with chlorine.

The spectrum for carbon of initial fibers is a single asymmetric line with additional excitation signals $\pi \rightarrow \pi^*$. After chlorination an additional signal shifted by ≈ 1.5 ч 2 eV with respect to main peak on the binding energy (E_b) scale arises in the C1s electron spectrum (see Fig. 1b, arrow). The value of E_b for the maximum of Cl2p-electron spectrum is equal to 199.8 ± 0.1 eV, which is close to E_b of the core electrons of chlorine covalently bound with carbon atoms in the series of organic compounds[1,2]. Observed changes in the C1s electron spectrum and E_b of chlorine core electrons indicate to the covalent binding of chlorine and carbon atoms. Taking into account nearly complete elimination of aliphatic fragments and significant decrease of oxygen content in the sample after preliminary high vacuum evacuation at high temperature, one may conclude that chlorine forms covalent bonds with edge atoms of nanometric graphite particles.

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