Chemical bonding effect on the resonance F KVV Auger emission from polytetrafluoroethylene

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Nowadays carbon nanosystems (CNS) are attention-getting material for scientists from different fields. In spite of great interest in fluorinated CNS, their atomic and electronic structures have been studied by using a limited number of experimental techniques up to now. One of the major problems of modern science is ascertainment of the role of hybridization of the valence electron states of fluorine atoms and surrounding atoms, i.e. the role of covalent bonding in the formation of free electron states in fluorinated systems. The aim of this work is to obtain information about features electronic structure and chemical bond for and fluorinated polymer (polytetrafluoroethylene, PTFE), which can be considered as a model fluorinated compound with covalent bonding, based on the analysis of the absorption spectra and resonant F *KVV* Auger electron spectra.

All measurements have been performed at the Russian-German beamline at the BESSY [1]. The PTFE sample was prepared with a sliding technique [2] which involved sliding (several times) a bar of PTFE over the surface of a flat silicon substrate covered with a ~ 1μ thick gold layer. Its thickness was in the range from ~ 10 to 30Å. Absorption spectra were measured using total electron yield. Photoelectron and resonant F *KVV* Auger spectra were collected in the angle-integrated mode using Phoibos 150 electron analyzer.

Owing to the analysis of the Auger emission spectra of PTFE near the F1s edge it was found that main Auger lines in resonant F *KVV* spectra excited with photon energies in the vicinity of the first absorption peak in the F1*s* spectrum are shifted to higher kinetic energy as compared with normal Auger spectrum. This effect is associated with strongly localized hybridized character of electronic states at the bottom of conduction band. These results are compared with the results for fluorine compounds with ionic (TiF_3) and ion-covalent (fluorinated multi-walled carbon nanotubes) bond. The high-energy shift in F *KVV* spectra differs in value for various compounds and therefore can be used for characterization of chemical bonding in fluorinated compounds and CNS.

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