

X-RAY PHOTOELECTRON SPECTROSCOPY AND ELECTRONIC
STRUCTURE OF d-ELEMENT PENTAFLUORIDE - GRAPHITE
INTERCALATION COMPOUNDS

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Graphite intercalation compounds (GICs) with XF_5 ($X = \text{Sb}, \text{As}, \text{Nb}, \text{Ta}, \text{Mo}$) are well-known members of the large family of synthetic metals. In this paper the results are reported of X-ray photoelectron spectroscopy studies of GIC $\text{C}_{22}\text{NbF}_5(\text{I})$, $\text{C}_{13}\text{TaF}_5$ (II) and C_8MoF_5 (III), which were prepared gas phase intercalation of XF_5 molecules.

(I): The C1s spectrum has two peaks at 283.8 eV and 285.0 eV (at assumption that the former corresponds to graphite itself which would arise from the decomposition of GIC surface because C_xNbF_y is relatively unstable). Nb 3d electrons give two peaks at 207.8 eV and 210.3 eV. The F1s spectrum shows one peak at 684.3 eV.

(II): The C1s spectrum has three peaks at 282.5 eV, 283.3 eV and 285.0 eV (at the some assumption about former peak that in (I)). Ta 4f electrons give two peaks at 26.8 eV and 28.3 eV. The F1s spectrum shows one peak at 684.2 eV.

(III): The C1s spectrum has three peaks at 281.0 eV, 283.8 eV and 285.0 eV (at the assumption that former corresponds to graphite). Mo 3d - electrons give two peaks at 232.1 eV and 235.1 eV. The F1s spectrum shows one strong peak at 683.6 eV and other weak peak at 681.0 eV.

The binding energy F1s electrons in (I) and (II) is almost the same that for the fluoride ion of other metal hexafluoride anions. Although the GICs have two different phases of XF_5 and XF_6^- , the F1s spectrum does not split into two peaks. This may be because the binding energies of F1s electrons in XF_5 and XF_6^- are similar to each other, or may be because formation of polymerized macromolecules.