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MOESSBAUER STUDIES OF GRAPHITE INTERCALATION COMPOUNDS OF ANTIMONY CHLORIDEFLUORIDES

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Graphite reacts with antimony pentahalides to form intercalation compounds with metallic conductivity. There has been a lot of discussions about the chemical species inhabiting the galleries in SbF_5- and $SbCl_5$-graphite. Recent investigations suggest that SbX_6^- and SbX_3 are formed as result of an electron transfer from graphite to the intercalate layers. ^{121}Sb Mössbauer spectrometry is used for determination the valence state and molecular configuration of Sb in $SbCl_4F$- and $SbCl_2F_3$-graphite. Besides $SbCl_5$-graphite which was synthesized by a soft intercalation technique in CCl_4-solution has been investigated.

The spectra exhibit one strong line which is assigned to Sb^{5+} (>95%). The isomer shift δ_{IS} relative to $CaSnO_3$ increases by replacing Cl by F in the compounds: C_xSbCl_5 (-2.75 mms^{-1}), C_xSbCl_4F (-1.43), $C_xSbCl_2F_3$ (+0.12), C_xSbF_5 (+2.06). Relatively high values of quadrupole splitting indicate low symmetry in the intercalated species.

The intercalation compounds show higher isomer shift than the solid halides. This difference may be due to a partial electron transfer and formation of polymeric anions containing halogen bridges.

The amount of Sb^{3+} in the graphite lattice could be increased by annealing a mixture of halides and graphite at 150°C for one week. It is to be assumed that intercalated antimony trihalides originate from thermal decomposition.