I6

PREPARATION AND CHARACTERISATION OF AN ADDUCT OF TIN(II) FLUORIDE AND ANTIMONY(III) FLUORIDE

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Both SnF_2 and SbF_3 are strong fluoride-ion acceptors, as shown by their ready formation of anions such as $[Sn_2F_5]^-$ and $[Sb_2F_7]^-$. SnF_2, in the solid state, forms $[Sn_4F_8]$ tetramers, which then interlink through weaker Sn-F interactions to give a highly-distorted, octahedral environment for the Sn atom. SbF_3 units can be recognised in the solid compound, but again weaker Sb-F interactions result in a distorted octahedral environment for the Sb atom.

Since both these fluorides can also act as fluoride-ion donors, with very strong acceptors, to form such cationic species as Sn^{2+}, SnF^+, SbF^{2+} and SbF_2^+, we have looked at their interaction to investigate their relative, fluoride-ion, donor-acceptor strengths.

We have isolated the adduct $2SnF_2 . SbF_3$ by sublimation from the melt and characterised it by full elemental analysis and by a crystallographic study.

If only the shortest distances from metal to fluorine atoms are considered, the structure can be described in terms of the ions $[Sn_3F_4]^{2+}$ and $[SnF_4]^{2-}$, separated by SbF_3 molecules. These SbF_3 molecules are pyramidal with average Sb-F at 1.95Å and F-Sb-F at 86.2°. The tin anion has the characteristic MF_4E trigonal bipyramidal coordination, with Sn-F distances of 1.90Å (equatorial) and 2.11Å (axial) and F-Sn-F angles of 94.8° (equatorial) and 152.4° (axial).

The tin cation has a helical arrangement with the central Sn atom coordinated to two bridging fluorine atoms at 2.01Å with F-Sn-F 99.4°, and the two outer tin atoms with Sn-F (bridge) 2.01, Sn-F (terminal) 1.95Å and F-Sn-F 94.8°.

If the next nearest neighbours to the metal atoms are considered then all metal atoms achieve the trigonal bipyramidal coordination and these four-coordinate metal atoms are linked into layers in the structure.

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