5. Summary

With $Cl_4^+ IrF_6^-$ a synthesis of a new homopolyatomic cation of chlorine has been achieved, and we have shown that the reaction of IrF_6 with Cl_2 described 31 years ago do not result in a compound containing the Cl_2^+ ion. The x-ray crystallography indicates that the product Cl_4^+ has a rectangular shape. The substance can be characterized furthermore by raman and ESR spectroscopy. Above –78 °C the compound decomposes to Cl_3^+ salts, whereas oxygen converts it to $Cl_2O_2^+$ salts, which have been described quite recently.[9]
The anion of the obtained $Cl_2O_2^+ HIr_2F_{12}^-$ shows a rare symmetric hydrogen bond between both IrF_6 units.

Complementary to the crystal structures of the known bromine cations, x-ray crystallographic studies of new Br_3^+ and Br_5^+ salts and the first Br_2F^+ salt are presented.

Another result of this work is the isolation and characterization by x-ray crystallography, raman and ESR spectroscopy of $AuXe_4^{2+} (Sb_2F_{11}^-)_2$, the first noble gas-metal compound. Not only it is new with respect to the Au–Xe bond, it is also one of a few true Au(II) compounds. The question whether this compound remains unique or if this is the first of a series of new complexes, cannot be answered yet.

The reaction of $XeF^+ SbF_6^-$ with $SbCl_5$ in HF/SbF_5 results in the formation of a $XeCl^+$ salt. This can be characterized by x-ray crystallography, raman and ^{129}Xe n.m.r. spectra.