Synthesis of Chlorinated non-IPR Fullerenes

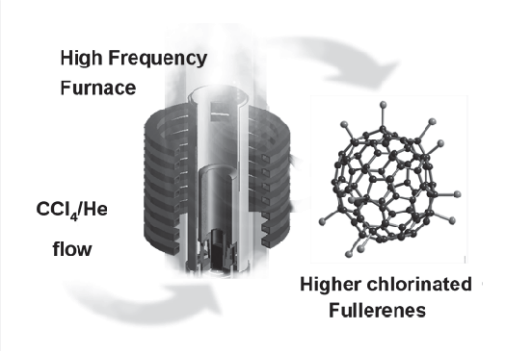
Amsharov K. [1], Ziegler K. [1], Mueller A. [1], Jansen M.*[1]

Max Planck Institute for Solid State Research,70569 Stuttgart, Germany
**e-mail: M.Jansen@fkf.mpg.de*

Despite intense research during the last 25 years, only a small fraction of all possible members of the fullerene family has been synthesized up to date. From these an even smaller part has been isolated and characterized.

This holds true already for the stable cages obeying the so called isolated pentagon rule (IPR), stating that all pentagons have to be completely surrounded by hexagons. To access those species, which all exhibit fused pentagons in their carbon cages, either endohedral or exohedral stabilization during the synthesis process is neccesarry. In recent years, it has been shown that in-situ chlorination during the synthesis in an arc-discharge reactor leads to the formation of various stable chlorinated non-IPR fullerene species.

The high – frequency furnace is an alternative synthesis approach which is based on the inductive heating of a graphite body as the carbon source.[1, 2] Vaporization of graphite in a chlorine containing atmosphere provides access to exohedrally chlorinated fullerene species including new members of the fullerene family not obeying the IPR-rule. Several new cage topologies encountered in this work, C_{56}, C_{62}, C_{68}, C_{70}, C_{72}, C_{74}, C_{78} and C_{80}, have been isolated. Two of which, namely $C_{56}Cl_{12}$ and $C_{72}Cl_4$, have been characterized by single-crystal X-ray analysis.



It is worth to emphasize that the high frequency furnace method is particularly efficient to produce chlorinated higher fullerenes.

[1] G. Peters, M. Jansen, Angew. Chem. Int. Ed. 1992, 31, 223.
[2] M. Jansen, G. Peters, N. Wagner, Z. anorg. allg. Chem. 1995, 621, 689.
[3] A. Mueller, K. Ziegler, K. Amsharov, M. Jansen, Eur. J. Inorg. Chem., 2011, 268–272.
[4] K. Ziegler, A. Mueller, K. Amsharov, M. Jansen, J. Am. Chem. Soc., 2010, 132, 17099–17101.
[5] K. Ziegler, A. Mueller, K. Amsharov, M. Jansen, J. Am. Chem. Soc., 2010, submitted.