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Highly reactive Monomers – Building Blocks for novel Oligomers, Polymers and giant Molecules

The talk will discuss two classes of main group element compounds, which are isolobal related to all carbon derivatives: (i) the parent compounds of the pnictogenyltrielanes (*pnictogen*: Group 15 element; *triel*: Group 13 element) and (ii) polyphosphorus ligand complexes.

The parent compounds of the pnictogenyltrielanes of type **A** (Fig. 1) have been never synthesised nor detected in the gas phase or by matrix isolation techniques. By Lewis acid/base stabilisation as well as by an only Lewis base stabilisation the first representatives of type **B** and **C** have been obtained.¹ Whereas the Al and Ga containing compounds show a high tendency to eliminate H₂ to form oligomers and polymers,² the boron containing ones undergo only a polymerisation reaction after elimination of the base from type **C** compounds.³ Moreover, the catenation of such monomeric units to cationic, anionic or neutral oligomers will be presented.⁴

Furthermore, the five-fold symmetric P₅ ring of the pentaphosphaferrocenes [Cp^RFe(η⁵-P₅)] enables these complexes for unique supramolecular aggregations to form nano-sized spherical molecules. By the coordination of the lone pairs at the phosphorus atoms of the polyphosphorus ligands to Lewis acidic Cu(I) and Ag(I) units, respectively, unprecedented giant spheres are formed (i) exhibiting fullerene-like topology constructed by non-carbon atoms (Figure 2) or (ii) giant superspheres are obtained revealing a topology beyond the Fullerene-design (Figure 1b).⁵ The largest sphere so far (4 x 5 nm) comes close to small- and medium-sized proteins as for instance hemoglobin (Figure 1c).⁶ Moreover, first results for the alignment of spherical balls by bidentate linkers will be presented leading to a 3-dimensional extended network.

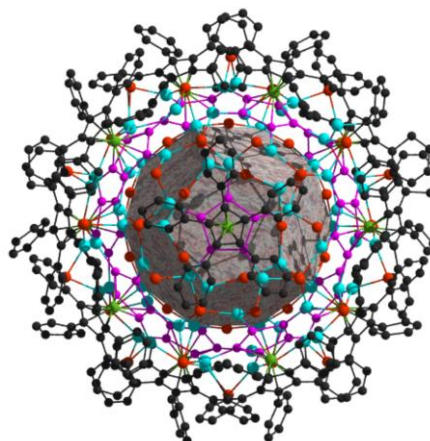
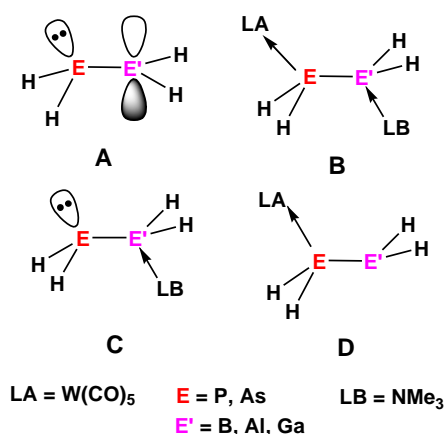


Fig. 1 Parent compounds of the pnictogenyltrielanes Fig. 2 Molecular structure of a nano-sized supersphere

- (1) a) U. Vogel, A. Y. Timoshkin, M. Scheer, *Angew. Chem. Int. Ed.* **2001**, *40*, 4409-4412; b) K.-Ch. Schwan, A. Timoshkin, M. Zabel, M. Scheer, *Chem. Eur. J.* **2006**, *12*, 4900-4908.
- (2) M. Bodensteiner, U. Vogel, A. Y. Timoshkin, M. Scheer, *Angew. Chem. Int. Ed.* **2009**, *48*, 4629 – 4633.
- (3) C. Marquardt, T. Jurca, K.-Ch. Schwan, A. Stauber, A. V. Virovets, A. Y. Timoshkin, G. R. Whittell, I. Manners, M. Scheer, *Angew. Chem. Int. Ed.* **2015**, *54*, 13782–13786.
- (4) C. Marquardt, T. Kahoun, A. Stauber, G. Balázs, M. Bodensteiner, A. Y. Timoshkin, M. Scheer, *Angew. Chem. Int. Ed.* **2016**, *55*, 14828–14832.
- (5) E. V. Peresypkina, A. V. Virovets, M. Scheer, *Crystal Growth & Design* **2016**, *16*, 2335-2341.
- (6) C. Heindl, E. V. Peresypkina, A. V. Virovets, W. Kremer, M. Scheer, *J. Am. Chem. Soc.* **2015**, *137*, 10938.