

N-Heterocyclic Carbene-Group 15 Element(I) Adducts: New Main-Group Work Horses for Transition Metal Chemistry

Dr. Adinarayana Doddi

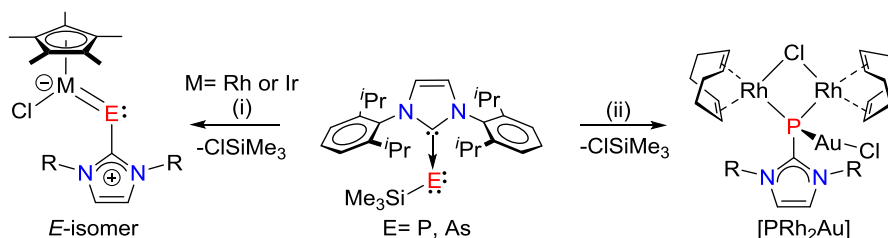
Institute of Inorganic and Analytical Chemistry, TU Braunschweig, Germany

Pnictinidenes (:P-R) are highly reactive low-valent E(I) compounds and are considered as analogues of carbenes (:CR₂) and nitrenes (:N-R). These systems are stable only at very low temperatures and in the gas phase. Consequently, isolation of such species (for instance phosphinidenes, :PR) was achieved by



not only employing metal centers but also strongly sigma donating Arduengo type N-heterocyclic carbenes in the form of (NHC)→pnictinidene adducts.^[1,2] Very recently, we have developed a novel high yielding method for the isolation of NHC supported pnictinidene adducts [(NHC)ESiMe₃ and (NHC)PH (NHC = IDipp, IMes, E = P, As) and it was introduced as a synthon for the preparation of terminal carbene–phosphinidenide transition metal complexes of the type [(IDipp)P]ML_n] (ML_n= (η⁶-p-cymene)RuCl and (η⁵-C₅Me₅)RhCl) (Scheme).^[3] The spectroscopic and structural characteristics showed their similarities with aryl-phosphinidene counterparts.^[3,4] The monoanionic “(IDipp)P” moiety forms highly covalent metal-phosphorus double bonds and is also capable of bridging two or three metal atoms (Scheme 1).^[5] In this presentation, isolation of several reactive adducts of the type (NHC)ER (E = group 15 atom) and their applicability in the homogeneous gold catalysis as new ancillary ligands and in the stabilization of novel main-group and transition metal organometallic fragments will be discussed in detail.^[6-8]

The monoanionic “(IDipp)P” moiety forms highly covalent metal-phosphorus double bonds and is also capable of bridging two or three metal atoms (Scheme 1).^[5] In this presentation, isolation of several reactive adducts of the type (NHC)ER (E = group 15 atom) and their applicability in the homogeneous gold catalysis as new ancillary ligands and in the stabilization of novel main-group and transition metal organometallic fragments will be discussed in detail.^[6-8]



Scheme: Phosphinidenide metal complexes; *i*) [(Cp*)MCl₂]₂ and *ii*) [Rh(COD)Cl]₂ and AuCl.

References

1. A. J. Arduengo, III, H. V. R. Dias, J. C. Calabrese. *Chem. Lett.* **1997**, 143-144.
2. H. Aktaş, J. C. Slootweg, K. Lammertsma. *Angew. Chem. Int. Ed.* **2010**, *49*, 2102-2113.
3. A. Doddi, D. Bockfeld, T. Bannenberg, P. G. Jones, M. Tamm, *Angew. Chem. Int. Ed.* **2014**, *53*, 13568-1357
4. M. Peters, A. Doddi, T. Bannenburg, M. Freytag, P. G. Jones and M. Tamm. *Inorg. Chem.* **2017**, *56*, 10785-10793.
5. A. Doddi, D. Bockfeld, A. Nasr, T. Bannenberg, P. G. Jones, M. Tamm. *Chem. Eur. J.* **2015**, *21*, 16178-16189.
6. (a) D. Bockfeld, A. Doddi, P. G. Jones and M. Tamm. *Eur. J. Inorg. Chem.* **2016**, 3704-3712; (b) A. Doddi, D. Bockfeld, M. Tamm., *Z. Anorg. Allg. Chem.* **2018**, 00-00. *In press.*
7. A. Doddi, D. Bockfeld, P. G. Jones and M. Tamm. *Dalton Trans.* **2017**, **46**, 15859-15864.
8. A. Doddi, M. Weinhart, A. Hinz, D. Bockfeld, J. M. Goicoechea, M. Scheer and M. Tamm. *Chem. Comm.* **2017**, *53*, 6069-6072.