Cationic Phosphines:
Synthesis & Applications

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Cationic Phosphines: Synthesis and Applications

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Phosphines bearing one, two or three positive charges have been synthesized by reaction between 1-chloro-2,3-bis(dialkylamino) cyclopropenium, or 2-chloro-1-alkylpyridinium salts with different phosphorus sources. Density functional calculations indicate that all these P-centred cations, despite of their moderate to high positive charges, feature a non-bonding electron pair on the P atom (HOMO) and a very low-lying LUMO that confers them excellent pi-acceptor properties. Encouraged by their electronic properties we decided to test the potential of these compounds as ancillary ligands and prepared a set of gold, rhodium and platinum complexes. The practical utility of such coordination compounds in catalysis has been demonstrated in several mechanistically diverse transformations. Additionally, taking advantage of the saline nature of our ligands, the recycling possibilities of the catalysts thereof derived have been also explored.

His research is primarily directed toward the coordination chemistry of main group element in unusual oxidation states, the design of novel “frustrated Lewis pairs” and applications thereof to homogeneous catalysis and organic synthesis.

Vita

Since 2008: Independent Junior Group Leader at the Max-Planck-Institut für Kohlenforschung

2005-2008: Postdoctoral research at the Max-Planck-Institut für Kohlenforschung (Prof. Dr. Alois Fürstner) on the “Design and applications of ylidic and bis-ylidic systems” and “Enantioselective protecting group-free total synthesis of ecklonialactone A and B”

2005: PhD from the Instituto de Investigaciones Químicas (CSIC) (Dr. José M. Lassaletta) on the “Synthesis and structure of new NHC-ligands”

2002: Master Degree from the University of Seville, Spain (Prof. Dr. Rosario Fernández) on the “Synthesis and applications of bis-hydrazones as ligands in asymmetric catalysis”

2000: Chemistry Degree from the University of Seville, Spain

1978: Born in Alcalá de Guadaira, Spain

Awards

2013: Young Scientist Award from the Academy of Sciences of Göttingen
2013: ADUC Annual Prize for Habilitands 2012
2013: Science Award of the Industrie-Club Duesseldorf and the North Rhine-Westphalian Academy of Sciences, Humanities and the Arts
2013-2017: Lecturer's scholarship ("Dozentenstipendium") of the Chemical Industry Fund
2012: Sponsorship Award of Dr. Otto Roehm Commemoration Foundation
2011: European Research Council Starting Grant for his research “Activation of small molecules by organic frustrated Lewis pairs"
2011: Sigma-Aldrich-RSEQ Prize for Outstanding Emerging Researcher
2010: Thieme Journal Award 2010
2009: Young Scientist Award from the Academy of Sciences of Seville, Spain
2007: Best PhD Thesis in Chemistry, University of Seville, Spain
2000: Graduation Prize from the University of Seville, Spain