Ligand Design, Artificial Enzymes and Renewable Feedstocks in Homogeneous Catalysis

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GEQO Grupo Especializado de Química Organometálica de la Real Sociedad Española de Química
RSEQ Real Sociedad Española de Química El Sitio de la Química en España

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The reactivity of organotransition metal complexes is dependent on the ligand environment of the metal. Ligand development has led to a tremendous growth of transition metal catalysis in organic synthesis owing to the obtained high reactivity under mild conditions and the large functional group compatibility. The major activity of our group is in the field of ligand synthesis based on phosphorus donor atoms by rational design assisted by molecular modelling. Ligand design is supported by thorough mechanistic (in-situ) studies of catalytic reactions to acquire insight in structure-activity relations. Ligands like phosphines, phosphoramidites and phosphites have a large effect on rate and selectivity of several transition metal catalysed carbon-carbon bond formations. We have been exploring several approaches to develop new selective catalysts. Both rational ligand design and combinatorial approaches have been pursued. Besides the study of well-known steric and electronic ligand effects the influence of ligand geometries around the metal centre is a key issue in this research. In addition shape selective catalysis by development of hybrid transition metal modified biocatalysts is being explored. These concepts are explored in important C-C and C-X coupling reactions as well as in carbonylation chemistry.

Paul C. J. KAMER did his MSC in biochemistry at the University of Amsterdam and his Ph.D. in organic chemistry at the University of Utrecht. As a postdoctoral fellow of the Dutch Cancer Society (KWF) he spent 1 year at the California Institute of Technology and 1 year at the University of Leiden, where he worked on the development of phosphorothiate analogues of nucleotides. Then he moved to the University of Amsterdam to work in the field of catalysis with Prof. Piet van Leeuwen, where he was appointed full professor of homogeneous catalysis in January 2005. In 2005 he also received a Marie Curie Excellence Grant to move his activities to the University of St Andrews where he is currently professor of Inorganic Chemistry. His current research interests are (asymmetric) homogeneous catalysis, organometallic chemistry, combinatorial synthesis, artificial metalloenzymes and catalytic conversions of renewable feedstocks.