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Editorial

Homogeneous gold catalysis – Still accelerating

Over the past 8 years we have witnessed an exponential growth of homogeneous gold-catalyzed reactions in the literature. It still is puzzling that before 1986 barely anyone has used homogeneous gold catalysts for organic synthesis and that even after the report of Ito, Sawamura and Hayashi on highly enantioselective gold-catalyzed reactions in 1986, only a few groups joined the field, but their research activity died down around 1998. Now 2008 marks the tenth year of gold-catalysis in my group. Starting from a research proposal for a Heisenberg fellowship of the DFG, which I submitted in November of 1998, my coworker and I started the experiments and submitted the first manuscript one year later; it finally appeared in 2000. In that year overall only three publications on homogeneous gold-catalyzed reactions have been published, and it is a pleasure for me to see how active the field has become and that the creativity of the many groups in the field has created a hot spot in catalysis research, the number of publications will exceed 200 this year.

Gold-catalyzed reactions already had significant impact on organic synthesis. Some of the reactions are relatively simple conversions, for example additions of small nucleophiles to alkynes – then the major benefit of gold catalysis is the high activity of the gold catalysts. Another, more general benefit is the high functional group tolerance coming along with the mild reaction conditions. For example, aryl halides in most cases are tolerated and do not oxidatively add to the metal center. Most fascinating are these reactions, which lead to a high increase in molecular complexity, for example the formation of complex polycyclic frameworks from open-chained starting materials in only one gold-catalyzed step. These reactions can be a challenge for retrosynthetic thinking, the relation between the product and the starting material is no easy to recognize. Quite a number of these reactions have already been applied in the total synthesis of natural products.

For some gold-catalyzed reactions, organometallic catalysts have been used, namely *N*-heterocyclic carbene complexes of gold. But in the majority of the reactions inorganic complexes of gold are used, typical ligands being phosphanes for gold(I), pyridine derivatives, halides or related donors for gold(III).

In the latter cases, organometallic chemistry is still involved, these gold complexes show a high affinity for carbon atoms in π -bonds, especially in alkynes. This leads to organometallic intermediates in the catalytic cycle. In most cases, the gold catalyst acts as a π -philic Lewis acid only, with respect to the gold center the reactions are isohypsic in nature – the oxidation state of gold does not change in the steps of the catalytic cycle.

In this special issue of *Journal of Organometallic Chemistry* exciting contributions from different sectors of homogeneous gold catalysis have been assembled. This covers a broad range of different subjects like hydroarylations, allylations, cycloisomerisations, cycloadditions, substitutions, the study of elemental steps, ionic liquids as solvents, *N*-heterocyclic carbenes as ligands, asymmetric reactions and oxidation reactions.

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