

complexes or ligands that are either poorly soluble in water or unstable in water. Ionic liquids have been explored as solvents for transition metal catalysts for over 20 years, and used in hydrogenation and hydroformylation reactions (DuPont, Texaco, Unilever). A new range of room temperature non-aqueous ionic liquids (NAILs) were presented by Olivier based on organic cations (such as quaternary phosphonium or ammonium ions) and inorganic anions (such as AlCl_4^- , Al_2Cl_7^- , BF_4^- , PF_6^-). The transition metal catalysts remain in the ionic liquid, giving the benefits of reduced catalyst consumption and disposal. By changing the combinations of anions and cations the ionic liquids can be tailored to industrial reactions, thus providing new solvents for hard or soft metal catalysts.

Other novel ideas were presented in the two poster sessions and some of these will undoubtedly mature in time for the next conference in this series, which is to be held in Lyon, France in 2001.

One poster, which won a poster prize was by R. L. Augustine (Seton Hall University, U.S.A.), who described the immobilisation of homogeneous catalysts on high surface area supports such as carbon, silica and alumina. It will be interesting to see whether his work will justify the opening remarks on synergy made by Professor Basset.

The proceedings of this conference will be published in a special issue of the *Journal of Molecular Catalysis*.

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Combinatorial Chemistry Identifies Fuel Cell Catalyst

The combinatorial chemical screening of large numbers of samples has received much attention in recent years, particularly due to its use in drug discovery for the identification of new leads, although the approach has been used for about twenty years to find new inorganic materials. The technique is now being adapted and applied to finding new materials (1).

Direct methanol fuel cells (DMFCs) have an advantage over other fuel cells in converting methanol directly at the anode to electricity, but poor performance has limited their commercialisation, the major limitations being anode and membrane performances (2). Combinatorial screening can be used to find more active electrochemical catalysts, but presently-used current-voltage methods are time-consuming and cumbersome for such large numbers of samples. In other combinatorial screenings, a fluorescent indicator has been used to detect the presence of ions (such as H^+), the intensity of the fluorescence being an indication of activity.

Now, fluorescent detection and combinatorial chemistry have been used by scientists at Pennsylvania State University, Illinois Institute of Technology and ICET in Massachusetts to identify a combination of platinum group metals with improved properties, which they say may be used as the anode in a DMFC (3).

Platinum, ruthenium, osmium, iridium and rhodium were combined in a 645-electrode array, deposited onto carbon paper and screened in a methanol/fluorescent indicator medium. The most active components were selected; bulk

samples were characterised by various techniques and tested as anode catalysts in DMFCs. The best combination was Pt(44)/Ru(41)/Os(10)/Ir(5), which had a current density 40 per cent higher than presently used Pt-Ru at 400 mV and more than double the value under short circuit conditions.

With this method a wide range of compositions was searched rapidly and thoroughly, allowing areas of apparent inactivity to be investigated. In fact, the activity of this particular combination does not lie in the expected active regions. Such optical screening may be useful to identify other electrochemical materials.

References

- 1 *Chem. Week*, Aug. 12, 1998, 501, p. 18
- 2 M. P. Hogarth and G. A. Hards, *Platinum Metals Rev.*, 1996, 40, (4), 150
- 3 E. Reddington, A. Sapienza, B. Gurau, R. Viswanathan, S. Sarangapani, E. S. Smotkin and T. E. Mallouk, *Science*, 1998, 280, (5370), 1735

The Development of the Platino-Calixarenes

In the January 1998 issue of *Platinum Metals Review*, on page 15, right hand column, the seventh line should read "obtained by reacting complex 3 with 4,4'-bipyridine, see Scheme V." In the legend of Scheme V L^+ must be replaced by 3.

Polymers of Platinum Metals Complexes Immobilised on Electrodes

In the April 1998 issue of *Platinum Metals Review*, on page 61, right hand column, the thirteenth line should read "[Rh(bpy)(PPh₂Et)₂(Cl)(H)]⁺".