conversion of linear alkanes to aromatics. E. G. Derouane, V. Jullien-Lardot, R. J. Davis, N. Blom and P. E. Højlund-Nielsen (Facultés Universitaires, Namur) have demonstrated that palladium on alumina-stabilised magnesia affords high selectivities in conversion of *n*-hexane to benzene. They used ^{27}Al magic-angle spinning NMR to show that Al^{3+} ions occupied both tetrahedral and octahedral holes in the magnetic structure.

Syngas Reactions

The popularity of syngas reactions as a subject for research is now much diminished, and only three contributions to the Congress dealt with the role of the platinum metals as catalysts for these reactions. Rhodium is well-known for its ability to give higher oxygenates, especially ethanol, and A. L. Borer and R. Prins (Federal Institute of Technology, Zürich) confirmed previous findings on the promoting effect of lanthana on rhodium on silica catalysts. They showed moreover that the order in which the components are introduced to the support is important, higher dispersions of rhodium being obtained when lanthanum is applied first to the silica. Higher oxygenates can also be produced when carbon monoxide reacts on rhodium catalysts with adsorbed species formed from chlorinated molecules and alkenes (M. W. Balakos, S. S. C. Chuang, R. Krishnamurthy and G. Srinivas, University of Akron). K. R. Krishna and A. T. Bell (University of California, Lawrence Berkeley Laboratory) applied transient-response isotopic tracer methods to follow chain-growth during Fischer-Tropsch synthesis on ruthenium upon titania catalysts. The chain-growth probability, α, decreases with temperature because the activation energy for termination exceeds that for propagation.

Conclusion

The 10th International Congress on Catalysis proved a most stimulating and enjoyable occasion, and the organisation was faultless. The posters, as well as the papers presented orally, confirmed the pre-eminent role of the metals of the platinum group in the field of heterogeneous catalysis. The proceedings will be published in the first half of 1993. The 11th Congress will take place in Baltimore, Maryland, U.S.A, in 1996. G.C.B.

Progress in Palladium Membrane Catalysis

In the April 1992 issue of this journal two papers from Russia were concerned with palladium alloy membrane technology (1, 2). Now this topic has again been featured, in a useful review of high temperature membrane catalysis by John N. Armor of Air Products & Chemicals, Inc., Allentown, Pennsylvania (3).

High temperature membranes are those that can be used at temperatures above 200°C, and suitable materials include: inorganic oxides, carbon, palladium and its alloys, and composites. While the use of palladium-based membranes is limited to reactions that involve hydrogen, the high solubility of hydrogen in palladium and the fact that it is currently being fabricated into thin foils makes it particularly suitable for these reactions. To avoid problems associated with the α/β phase transformation, the operating temperature should be above 310°C.

The benefits that are encountered when palladium is alloyed with silver, ruthenium, rhodium and rare earths, are considered, as are the limitations of such membranes. For the future, the potential for commercial exploitation is seen to be with catalytic materials deposited on monomodal sub-8 Å inorganic membranes, and with thin metal alloy coatings on mesoporous supports. Already studies have been made of composite membranes consisting of palladium and silver-palladium deposited on the outer surface of porous glass tubes and porous alumina cylinders by electroless plating techniques.

While many problems have still to be overcome, it is concluded that the progress made to-date in membrane catalysis encourages further fundamental research on the topic.

References

1 V. M. Gryaznov, *Platinum Metals Rev.*, 1992, **36**, (2), 70–79

2 V. Z. Mordkovich, Yu. K. Baichtock and M. H. Sosna, *ibid*, 90–97

3 J. N. Armor, *Chemtech*, 1992, **22**, (9), 557–563