

Catalysis of One Carbon Molecules

THE ROLE OF PLATINUM METALS IN THE PROVISION OF CARBONACEOUS MATERIALS FOR THE CHEMICAL INDUSTRY

As the availability of crude oil decreases the chemical industry will have to change its raw material basis from crude oil to other sources of carbon. The recent international symposium held at Bruges, Belgium under the auspices of the Belgian Inter-University Consortium for Research in Catalysis, the Vlaamse Chemische Vereniging and the Société Chimique Belge provided an opportunity for participants to consider solutions to some of the problems that may arise during this transition. Fortunately almost all carbonaceous raw materials can be converted into synthesis gas which can then be used for a variety of manufacturing applications. Several of the papers presented were concerned with the application of platinum group metal catalysts; a number are reviewed here.

An invited lecture was presented by Dr. M. E. Dry, SASOL, South Africa, on the Fischer-Tropsch process, and several papers set out to elucidate the mechanism of this synthesis. P. Biloen, J. N. Helle, F. G. A. van de Berg and W. M. H. Sachtler, Koninklijke/Shell Laboratory, Amsterdam, reported comparative results obtained with nickel, cobalt and ruthenium catalysts. They concluded that the reaction was limited by the number of active sites rather than by intrinsic activity. K. Lázár, Z. Schay and L. Guzzi, of the Hungarian Academy of Sciences, described the correlation between surface carbon and carbon monoxide/hydrogen selectivity on iron and iron-ruthenium catalysts established using in situ Mössbauer spectroscopy and kinetic studies. The effect of the support on the activity and selectivity of rhodium systems was presented by P. Mériaudeau, H. Ellested and C. Naccache, Institut de Recherches sur la Catalyse, France. A metal support interaction between rhodium and titania was proposed to explain the favoured formation of olefins and long chain hydrocarbons over this catalyst.

Professor K. G. Caulton, of the Indiana University, U.S.A. reviewed current progress in our understanding of possible mechanisms of carbon monoxide hydrogenation derived from the studies of homogeneous systems. Model studies with Group VIII transition metals of relevance to methanol synthesis from synthetic natural gas were discussed.

The co-ordination chemistry of formaldehyde iridium complexes was reviewed by D. L. Thorn of E. I. Dupont de Nemours. Later J. C. Conesa, M. T. Sainz, J. Soria, G. Munuera, V. Rives-Arnau and A. Munoz of the University of Seville, described studies of the effect of carbon monoxide adsorption on $\text{RhCl}_3/\text{TiO}_2$ catalysts and its reactivity with hydrogen. The results indicate the possible role of intermediate rhodium oxidation states in catalytic processes with carbon monoxide. The carbonylation of methanol to acetic acid with rhodium and cobalt catalysts was reviewed by Dr. D. Forster of Monsanto, who emphasised the superior performance of the rhodium iodide catalyst. Ruthenium and mixed cobalt ruthenium systems are at present the most selective catalysts for methanol homologation to ethanol. G. Braca, G. Sbrana and G. Valentini, of the University of Pisa, Italy, reported the results of a study of the role and effect of iodide promoters and ligands on ruthenium catalysed methyl acetate homologation to ethyl acetate.

On the final day R. P. A. Sneeden, Institut de Recherches sur la Catalyse, lectured on the homogeneous and heterogeneous catalytic reactions of carbon dioxide. Others described results pertaining to the hydrogenation of carbon dioxide over supported palladium catalysts and carbon monoxide and carbon dioxide over supported rhodium catalysts.

The papers presented at the symposium will be published in a special issue of the *Journal of Molecular Catalysis*. F.K.