Plenary and Session Lectures

C1

Olefin Insertion and C–H Activation Reactions of Organolanthanides

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Three general reaction pathways of organolanthanides will be discussed, illustrated by chemistry of the complex $M(\eta^5\text{-}C_5Me_5)_2R$ (M = Lu, Yb, Y; R = H, CH_3). These are:

- olefin insertion into the M–C or M–H bonds,
- β-alkyl elimination – the reverse of olefin insertion into the M–C bonds – and
- C–H activation reactions. In particular, the results of a mechanistic study of the exchange reaction of $Lu(\eta^5\text{-}C_5Me_5)_2CH_3$ with methane, ^{13}C, will be presented.

C2

Advances in Polymerization Catalysts Based on 4 and 5F Groups of Periodic Table

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So far, in the development of new catalyst systems, the attention of chemists has been customarily addressed to catalyst activity, regio and stereospecificity. Nowadays, the impact of catalyst systems on other aspects of a chemical process has to be taken in due account, in relation to the increased cost of raw materials and energy.

After showing the incidence of materials, utilities, manpower, investment on the production cost of a high density polyethylene process (typical representative of plastics) and of a high *cis* polybutadiene process (typical representative of a synthetic rubber), the potential impact of the catalyst system on the different cost items is pointed out. As an example, the possible economic advantages of new polymerization catalysts based on actinides and lanthanides are illustrated with reference to an improved high *cis* polybutadiene process.

As a conclusion, the necessity of an even more strict cooperation between scientists investigating new organometallics and catalysts and, on the other side, process technologists and engineers is pointed out. Only by an early cooperation of this type can the advantages offered by 4 and 5f groups transition metals be transferred to improved industrial process and some development mishap can be avoided.

C3

Studies of the Fischer-Tropsch Process on Uranium Catalysis

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In the study of the catalytic reaction of uranium powders, phenylacetylene and dimethylacetylenedicarboxylate were converted to polymers via liner-oligomerization and cyclo-oligomerization (T.C. Wen and C. C. Chang *etc.*, *J. Am. Chem. Soc.*, *103*, 4576, 1981). Our results indicate a new synthetic pathway of the carbon-carbon bond formation through the participation of f-orbital elements. In this report, reactions of methylenediiodide, diazomethane and ketene were studied. The products of these reaction, *i.e.*, C_1 and C_4, alkanes and alkenes suggested that the bond could be formed by the insertion of methylene radicals. An interesting phenomenon, where the carbon numbers of products increased with the duration of the reaction period, was found.

The role of the uranium element in the Fischer–Tropsch process was studied. Hydrogen and carbon monoxide were catalyzed to methane (60–70%), CH_3OH (20–25%). C_2H_5OH, $CH_3OCH_2OCH_3$ at one atmosphere pressure, 250 °C. The Fischer-Tropsch process could proceed through uranium alkoxide intermediates. This oxide-formation mechanism was tested by the pyrolyses of uranium alkoxides.