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Foreword
Selective Oxidation by Heterogeneous Catalysis

Within this large segment of heterogeneous catalysis research the fields of methane coupling and methane partial oxidation to syngas were brought together with the areas of partial oxidation and ammoxidation of small hydrocarbon molecules. In all areas a rather mature phenomenological understanding became apparent during the symposium which was illustrated by a variety of kinetic experiments and their global evaluation in these areas; mostly, thorough understanding of the underlying surface processes was still lacking.

The important aspect of acidity has been introduced in detail into a picture of the active surface. Proton activity is important for controlling adsorption and selectivity of the main reaction. Catalytic cycles of dehydrogenations leave OH groups on the catalyst, the removal of which is also an important aspect of steady state activity. The role of Lewis acidity is more complicated as the distinction between coordinatively unsaturated metal sites and a redox centre is not unambiguous. A significant defect in knowledge about quantitative aspects of chemisorption and counting of active sites became apparent during the discussions.

The field has also reached a stage at which a variety of microscopic theoretical concepts ranging from rigorous quantum mechanical treatments over semi-empirical quantum chemical models to microkinetic considerations are being developed. The discussions showed that a deficit exists concerning the structure of the reacting surface. To this end the opening lecture demonstrated the achievements of surface science in the area of oxide materials. It can be concluded that despite the significant progress in preparation and investigation of single crystal oxide films there is still a wide gap in the solid understanding of the structure and dynamics of surfaces on model substances of binary oxides and the situation of the usually multicomponent practical oxide catalysts.

The contributions of this issue represent as a whole the state of the art in the field and may inspire further studies both in the areas of detailed kinetics and reactivity of organic substrates and of surface structure and inorganic solid state chemistry.

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