

Preface

Advances in natural gas conversion

This volume contains contributions to the session “Advances in natural gas conversion” at the Fourth European Congress on Catalysis, Rimini, Italy, 5–10 September 1999. The conversion of natural gas into liquid fuels represents a major challenge to catalysis. Gas to liquids (GTLs) has become fashionable. The energy supply is changing from being primarily oil based to become more gas based. It has become important to possess gas resources as well as technology for utilizing gas.

In spite of efforts to create a hydrogen energy, we shall depend on liquid fuels in particular for the transport sector for most of the century. The conversion of remote natural gas into liquid fuels has been discussed for decades since the first energy crisis. In most situations, projects involving liquefied natural gas (LNG) have proven to be more feasible. The gas conversion has suffered from the price differential between product and natural gas being too small.

However, a number of factors have changed. It is becoming unacceptable to flare associated gas from oil fields. Moreover, synfuels may have a premium value because they are sulphur-free and because they have high cetane or octane numbers. If the oil price is above 20–25 USD/bbl, large scale GTL-plants (i.e. 5000 t hydrocarbons per day) may become feasible with present technology. Although these capacities are more than twice of that of “state-of-the-art” they are still far below the capacities necessary for a feasible LNG-project. Therefore, in many situations, GTL is a more obvious choice.

Today the indirect conversion via synthesis gas is the preferred route. Although it is energy efficient, it involves large investments and is expensive. The syn-gas manufacture may be responsible for more than 60% of the investments. The keynote lecture (Lange)

puts this into perspective. For large GTL-plants, the partial oxidation of natural gas is more economic than tubular steam (or CO₂) reforming. This is reflected in seven papers on partial oxidation (Basini et al., Basile et al., Suzuki and coworkers, Santamaria and coworkers, Schuurman and coworkers, Anshits et al., and Grisel and Nieuwenhuys).

The academic literature on reforming reactions was scarce until about 10 years ago, but has been initiated more or less by the fashion of CO₂-reforming. Although this reaction may not have the industrial importance as claimed, it has caused a series of good studies of the mechanism of reforming reactions of general value (Tsipouriari and Verykios).

The direct conversion of natural gas into products is still far from being feasible, but it represents a potential for a break-through. Three papers deal with this (Guczi and Borkò, Frusteri et al., and Beretta et al.), and another three papers deal with the direct conversion of ethane and propane into high value products (Holmen and coworkers, Ueda and coworkers, and Derouane-Abd Hamid et al.).

The session had a high attendance and the discussion was lively, reflecting the importance of the field, however, it must be pointed out that there is still room for significant achievements. Last but not least, the average quality of the papers submitted has cancelled all the difficulties met during the preparation of this special issue, scientifically stimulating to act as Guest Editors. The appreciation by the readers will be the best award for our efforts.

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