Hydrogen production by aqueous-phase reforming of glycerin on noble supported catalysts

A. Boonyanuwat A. Jentys and J.A. Lercher
Department Chemie, Technische Universität München, Lichtenbergstraße 4, 85747 Garching

Hydrogen produced from renewable feedstocks such crude glycerin, which is the main by-product formed during bio-diesel production, will develop into an attractive alternative energy source in the near future. A low temperature process is being developed using noble metal catalysts supported on oxides. The reaction was performed in a fixed bed reactor at 225^0C and 29 bar. The gaseous products were analyzed by on-line GC, the liquid phase products by GCMS/FID.

Highly dispersed noble metal catalysts on alumina were studied for reforming of an aqueous glycerin solution (1 wt%). Over 0.8% wt Pt/Al_2O_3 the conversion of glycerin was 99% and the selectivity to hydrogen was above 90% with only small amounts of methanol, ethanol, acetic acid, propanol, acetol, ethylene glycol and propylene glycol being formed. The gaseous products contained hydrogen (69 mol%), carbon dioxide (9 mol%) and methane (2 mol%) as shown in figure 1. The concentration of carbon monoxide was less than 500 ppm, indicating that the catalyst and the conditions were effective for reforming and the subsequent water gas-shift reaction.

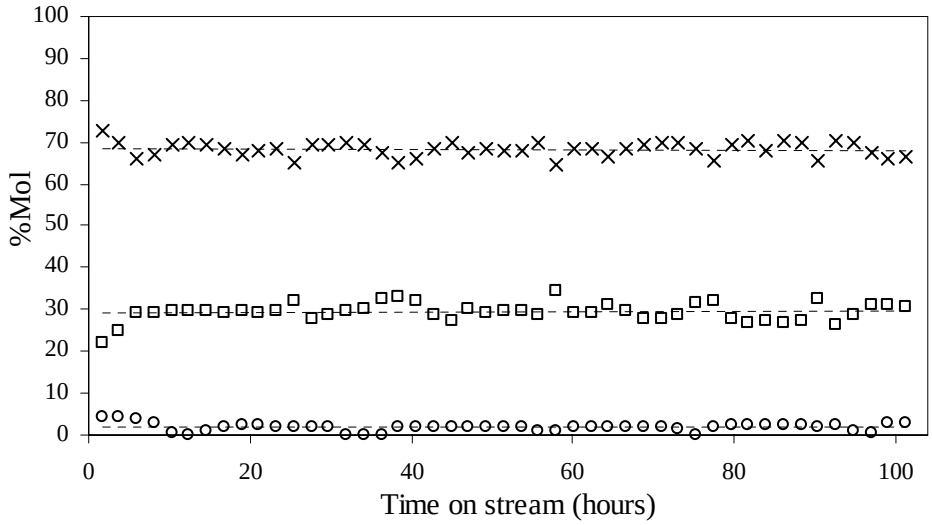

Figure 1. The concentration of gas products versus time H_2 (×) CO_2: (□); CH_4 (○)

In the presentation the catalytic activity of noble metals supported on alumina will be compared and the feasibility of operating at high glycerol concentrations in aqueous phase will be discussed.