Solid Acid Catalysts for Dehydration of Glycerol to Acrolein in Gas Phase

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The biodiesel production is accompanying with one problem - increase the production of glycerol as a by-product. Therefore the increase of biodiesel production results in the accumulation of glycerol, which leads to a price decline. Unfortunately, the current application of glycerol is mainly confined to pharmaceuticals and cosmetics and hence the demand is somewhat limited. The availability of large amounts of cheap glycerol is the driving force to develop new processes for its energetic or chemical utilization. Finding value-added alternatives to glycerol incineration would improve economic viability of biodiesel manufacture and the biofuel supply chain. One possibility is to perform an acid-induced dehydration of glycerol to acrolein.

Catalytic conversion of glycerol to acrolein by a double-dehydration reaction could be an important route for using glycerol resources and could offer a sustainable alternative to the present acrolein technology based on propylene. Increasing attention has consequently been paid to the selective dehydration of glycerol to produce acrolein using solid acid catalysts. The as-synthesized alumina and W- modified SBA-15 supported heteropolyacid catalysts using $H_3PW_{12}O_{40}.xH_2O$ and $(NH_4)_6H_2W_{12}O_{40}.xH_2O$ as precursors compounds were characterized by nitrogen adsorption, XRD, TG/DTA, Raman spectroscopy, UV-Vis DRS and TPD of NH_3.

In particular, the influence of selected support materials, catalyst loading, nature of precursor compounds and temperature on acrolein formation was studied at standard reaction conditions.