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Catalytic Conversion of Glycerol to Acetol and Acrolein Using Metal Oxides: Fundamentals, Prospects and Challenges

Tiago Pinheiro Braga [1]

[1] Laboratório de Peneiras Moleculares-LABPEMOL, UFRN. tiago.braga@ufrn.br

Abstract

Glycerol dehydration to acetol and acrolein is an interesting reaction pathway for conversion of biomass-derived products. However, they undergo extensive deactivation due to coke deposition and sintering, requiring the design of stable catalysts. The oxides stand out due to their natural abundance, simple synthesis, low cost and tunable acidic, basic and redox properties. Some remains have already reported different acid oxides in the glycerol dehydration to acetol and acrolein as well as basic and redox oxides, showing the most important theoretical foundations of heterogeneous catalysis to comprehend surface reactions and mentioning the different possibilities to understanding the different reactional pathway. Furthermore, the sequence of reactions which show the origin of the coke deposited on catalyst surface is presented. The role of the Lewis and Brønsted acid-base sites present in the metal oxides and their interactions on glycerol dehydration are described, providing a direction to design catalysts for selective dehydration reactions resistant against coke deposition and sintering. On the other hand, some challenges still need to be overcome in order to migrate from laboratory to industrial scale.