

Metal-Loaded Mesoporus Materials for Production of Dimethyl Carbonate

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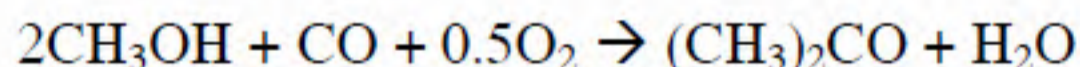
Abstract:

Relatively high yields of dimethylcarbonate (DMC) are obtained by reaction of carbon dioxide and methanol using ceria or zirconia-loaded mesoporous TUD-1 catalysts. Series of mesoporus TUD-1 catalysts loaded with different ratios of ceria, zirconia and mixture of these oxides were prepared directly by hydrothermal methods. Catalyst samples were characterized by x-ray diffraction (XRD), UV-Vis spectroscopy and scanning electron microscopy (SEM). Catalytic testing showed a better performance of TUD-1 loaded with mixed ceria and zirconia. However, relatively high DMC yields were obtained via introduction of dehydrating agents in the reaction mixture in addition to the catalyst.

Introduction:

Recently, dimethylcarbonate (DMC) has drawn much attention in phasing out environmentally unfriendly compounds in fuels. This is concluded by the large number of patents and research papers on the production and application of this material in the last two decades.[1] Conventionally, synthesis of DMC

Nevertheless, oxidative carbonylation of methanol has been recently pursued over a variety of catalysts as an “environmentally friendly” nonphosgene production pathway to DMC:



Previous investigations described new reaction routes, variety of catalysts as well as studies on the mechanism of the reaction pathway involved in the vapor-phase carbonylation of methanol to DMC over copper zeolite catalysts.[2,3] However, preparation of DMC by direct reaction of methanol and carbon dioxide still problematic due to the need of efficient catalysts, the methylating effect of DMC itself and the sensitivity of reaction to the formation of minute amounts of water.[4-7] therefore, an efficient, selective catalyst is needed for better production of this material, in this context, functionalized-TUD-1, 3-D mesoporus catalyst can be a good candidate for this process.

This paper includes preparation, characterization and testing of metal oxide-loaded mesoporous catalysts for preparation of dimethylcarbonate (DMC) through the reaction between methanol and carbondioxide employing a 3-D mesoporus TUD-1 catalysts loaded with ceria, zirconia and or a mixture of ceria and zirconia.