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Synthesis of Magnesium Oxide in Spinning Disk Reactor and Its Applications in Cycloaddition of Carbon Dioxide to Epoxides

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Abstract : CO_2 is believed to be partly responsible for changes to the global climates. Carbon capture and storage (CCS) is one way to reduce carbon dioxide emissions in the past. Recently, how to convert the captured CO_2 into fine chemicals gets lots of attention owing to reducing carbon dioxide emissions and providing greener feedstock for the chemicals industry. A variety of products can be manufactured from carbon dioxide and the most attractive products are cyclic carbonates. Therefore, the kind of catalyst plays an important role in cycloaddition of carbon dioxide to epoxides. Magnesium oxide can be an efficiency heterogeneous catalyst for the cycloaddition of carbon dioxide to epoxides because magnesium oxide has both acid and base active sites and can provide the adsorption of carbon dioxide, promoting ring-opening reaction. Spinning disk reactor (SDR) is one of the device of high-gravity technique and has successfully used for synthesis of nanoparticles by precipitation methods because of the high mass transfer rate. Synthesis of nanoparticles in SDR has advantages of low energy consumption and easy to scale up. The aim of this research is to synthesize magnesium hydroxide nanoparticles in SDR as precursors for magnesium oxide. Experimental results showed that the calcination temperature of magnesium hydroxide to magnesium oxide, and the pressure and temperature of cycloaddition reaction had significantly effect on the conversion and selectivity of the reaction.

Keywords : magnesium oxide, catalyst, cycloaddition, spinning disk reactor, carbon dioxide
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