

Metal oxides assisted cyclization of unsaturated fatty acids based on waste vegetable oil

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Metal oxides are widely employed as active catalysts or supports due to their reduction-oxidation and acid-base properties. The relatively low cost, high efficiency and recyclability has allowed different metal oxides to be used as catalysts in numerous synthetic reactions. Dimer acid, produced by the dimerization of unsaturated fatty acids, is a highly value-added product, and widely used as reactant in chemicals such as polyamides, plasticizer and lubricates. Herein, aluminum, titanium, zinc, calcium, magnesium and silicon oxide micro/nanoparticles are used in a Diels-Alder reaction to catalyze the production of the dimer acids. The metal oxides assist the electron transfers during cyclization to produce the desired product. Liquid chromatography mass spectroscopy (LC-MS) and gel permeation chromatography (GPC) were used to verify the production of dimer acids. For the confirmation of cyclization, compounds were analyzed using the nuclear magnetic resonance (NMR) spectroscopy. From the analysis, metal oxides were successful in the reaction to yield cyclic dimer acids. These results show aluminum and titanium oxides are effective catalysts for the cyclization of fatty acid.