

## Synthesis of bio-lubricant by esterification of long chain carboxylic acid using various sulfated zirconia catalysts

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The lubricants are used to minimize friction of the machine for reducing loss of fuel and used as antifreeze. The lubricants are classified as the mineral oil, synthesized oil and fatty oil depending on the materials. Especially, in the case of fatty oil, there is no hazardous substance because it is biodegradable and can reduce carbon dioxide emissions. In this work, the synthesis of biodegradable lubricants was studied with long chain FFAs and various alcohols, which they have more than 8 carbon atoms, using sulfated zirconia (SZ) without additional solvent and dehydrating agents for reaction. The prepared SZ catalysts were characterized using X-ray diffraction (XRD), N<sub>2</sub> adsorption and temperature programmed desorption (TPD) of NH<sub>3</sub>. SZ type 1 showed the highest oleic acid conversion (90.2%) and octyl stearate yield (88.6%). The large desorption peak of NH<sub>3</sub>-TPD confirmed that its numerous acid sites were responsible for its high activity. Increasing the reaction time and the reaction temperature had a favorable influence on the oleic acid conversion. In addition, no deactivation was observed for repeated reactions up to 5-time reactions.