

# Alternative Production of Fatty Acid Methyl Esters from Triglycerides Using Sulphated Zirconia

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## Abstract

*Sulphated zirconia (SZ) was synthesized using two different methods with the same molar ratio (1:6) of reactants: (1) the direct mixing of  $ZrOCl_2 \cdot 8H_2O$  and  $(NH_4)_2SO_4$ , designated as SZ1; and (2) via the conventional wet-precipitation method with a molar ratio of 1:6 rather than the conventional 15 ml  $H_2SO_4$  to 1g of  $Zr(OH)_4$ , denoted by (SZ2). The catalysts physiochemical properties were precisely characterized by FTIR, SEM, X-ray diffraction, EDX, XPS, and Py-DRIFTS techniques. The two methods of preparation with same molar ratio of sulphating agents led to sulphated zirconias that exhibited different morphological and structural properties in terms of specific surface areas, thermal stability, acid sites, and surface sulphate. The catalysts activity was tested in thermocatalytic cracking of triglyceride; a direct conversion process for fatty acid methyl esters (biodiesel). The SZ1 not only exhibited higher conversion of triglycerides but higher fatty acid methyl esters (FAMEs) yields of approximately 59% after 3h as compared to SZ2 (32%). In addition the sulphated zirconia, SZ1 was selective towards unsaturated esters whereas SZ2 was selective towards saturated esters.*

**Keywords:** Sulphated zirconia, Catalyst preparation, Thermocatalytic cracking, FAMEs

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**Received:** 2013/11/14

**Accepted:** 2013/12/30

DOI:<http://dx.doi.org/10.4314/njtr.v8i2.2S>