

Preparation and characterization of biomass carbon-based solid acid catalysts for the esterification biodiesel from marine algae

Abdulaziz A Al-Saadi, Azeem Rana and Chanbasha Basheer
King Fahd University of Petroleum and Minerals, Saudi Arabia

Biomass carbon-based heterogeneous acid catalysts have been formed by sulfonation of rice husk (RH), *Moringa oleifera* seeds (MOR) and biomass of lipid extracted marine algae (BM) in a microwave reactor at 200°C. The physiochemical characteristics of the prepared biomass-derived catalysts were determined with Fourier Transform infrared spectroscopy, Raman spectroscopy, scanning electron microscopy and X-ray diffraction techniques. These studies confirmed the presence of sulfur-incorporated functional groups on the carbonaceous materials. The acid site density of the catalysts was measured by utilizing an ion-exchange titration. It was found that the SO₃H-RH based catalyst carries the most prominent acid site density (4.24 mmol/g by NaOH titration) when compared to other prepared solid-acid catalysts. However, by employing SO₃H-RH and SO₃H-BM almost a full quantitative yield of ester was achieved with a 5wt.% mixture of catalyst/lipid for a reaction time of 20 minutes at a 5:1 M ratio of methyl alcohol/lipid extract, whereas the conventional sulfuric acid catalyst gave 70% yield after 2 hours under the same reaction conditions. The results clearly proved that SO₃H-RH displays a promising catalytic activity and stability when used compared to solid-acid and sulfuric acid catalysts.

Biography

Abdulaziz A Al-Saadi is an Associate Professor of Physical Chemistry at the Department of Chemistry, and the Dean of Sciences at King Fahd University of Petroleum and Minerals (KFUPM), Saudi Arabia. He received his BS and MS degrees from KFUPM in 1997 and 2000, respectively, and his PhD from Texas A&M University, the USA in 2006. One of his research interest currently is the implementation of molecular spectroscopy and DFT calculations to comprehend novel processes of selective and trace chemical detections of organic and metal ion targets as well as energy material related applications.

asaadi@kfupm.edu.sa

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