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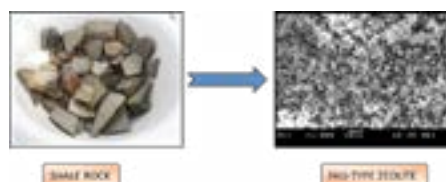
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Zeolite catalysts prepared from shale rock and kaolin for biodiesel synthesis

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Biodiesel is an alternative fuel produced by the transesterification of natural oils using heterogeneous catalysis. Here, Faujasite (FAU) zeolites were prepared using Iraqi kaolin and Irish shale rock and tested as catalysts in the esterification of oleic acid (a simulated fatty acid frequently used as a model reaction for biodiesel production). For preparations using shale rock; a systematic study was conducted (over the stated preparation ranges) by varying the Water:Shale ratio (4:1 to 15:1, by mass) and mixing (1-24 hours), aging (6-48 hours) and hydrothermal treatment times (6-72 hours) to determine the optimal parameters. XRD confirmed that the Faujasite product purity was highly dependent on the experimental conditions used and that its crystal purity was comparable to that of a commercial zeolite Y. The BET surface area of the calcined FAU-type zeolite was 571 m²g⁻¹. The prepared zeolite was catalytically active in the esterification of oleic acid with ethanol reaching a maximum of 78% conversion after 90 minutes, which is practically identical to that recorded for commercial zeolite Y for preparations using kaolin; XRD confirmed the characteristic FAU structure of zeolite Y (Si/Al ratio 3.1), and BET adsorption showed that the surface area was 390 m²g⁻¹. The optimum conditions for the oleic acid esterification were observed at 70 °C, 5 wt% catalyst loading and 6:1 ethanol to oleic acid molar ratio. The oleic acid conversion using the zeolite prepared from kaolin was 85% after 60 minutes, while the corresponding value for a commercial sample of HY zeolite was 76%. Our findings show that low Si/Al ratio zeolite Y is a suitable catalyst for esterification, which is in contrast to the widespread view of the unsuitability of zeolites, in general, for such applications. A full set of data showing structural characterization and catalytic testing will be presented at the conference.



Biography

Aidan M Doyle is an Industrial Chemist and Faculty Member in Physical Chemistry at Manchester Metropolitan University, UK. He has conducted his PhD at the University of Limerick and he was a Post-doctoral Research Fellow at the Fritz-Haber-Institute of the Max-Planck-Society, where he worked on a Johnson Matthey/ EPSRC funded project exploring the interaction of hydrogen and hydrocarbons with precious metal heterogeneous catalysts. He is also a Guest Editor of *Catalysis Today*, a Committee Member and former Treasurer (2012-2016) of the British Zeolite Association (BZA) and was the main Organizer of the Gordon style 2009 BZA meeting.

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