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ULTRA-HIGH DISPERSION OF MgO/CaO IN MESOPOROUS SBA-15 AND MACROPOROUS SBA-15 USING A ONE-POT METHOD: NOVEL MATERIAL PREPARATION AND APPLICATION AS A BASE CATALYST FOR TRANSESTERIFICATION

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PURPOSE OF THE ABSTRACT

Global uncertainty over fossil fuel security provides the impetus for the development of fuels from renewable feedstocks 1. A promising route to diesel is available through transesterification of vegetable oils 2. In this work, we report a novel development of the true liquid crystal templating 3 approach to the synthesis of ordered porous mixed-oxides. Via this route, a family of meso- and macroporous MgO/SBA-15 catalysts with metal loading in the range of 1.46 ? 8.51 wt.% have been prepared. Textural characterization of the materials show surface areas are > 500 and 600 m2/g for meso- and macroporous families respectively. Pore diameters have been determined by powder XRD and are found to be of the order of 3.0 and 4.0 nm for meso- and macro- families respectively. Elemental and XPS analysis suggests that majority of MgO is preferentially located within the pore network of all catalysts. TGA chromatogram showed desorption of gases evolved for magnesium species. TEM and SEM-EDX images show uniform dispersion of metal oxide in long channel SBA-15 materials for meso- and interconnected macropores for macro- materials.

Catalytic studies have been conducted in stirred batch reactors at 90?. Optimization studies that most favourable conditions are 10 mmol: excess tributyrin/tricaprylin, 50 mg catalyst and reaction time 24 h. Under these conditions 8.51 wt. % MgO/MM TLCT-SBA-15 was found to be most active, providing yielding > 78% of FAMES in 24 h. Overall trend in conversion show that macropore materials are suitable compared to mesopore materials and this is evident from higher triglycerides experiment. Furthermore, increasing the density of base sites increase catalytic activity, suggesting that the reaction is boosted by smaller MgO crystallites.

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FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

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