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Mining waste valorisation: Active mesoporous catalyst for the esterification of fatty acid palm oil waste

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PURPOSE OF THE ABSTRACT

The Amazon flint kaolin (FK) is an abundant, low-cost, environmentally friendly and viable by-product disposed of in commercial kaolin extraction mining, which can be reused as a source of silica to synthesize a mesoporous (3)SO3H/AlSiM catalyst in the esterification of distillate from the deodorization of palm oil (DDPO), a by-product with a high free fatty acid (FFA) content (84%), from the palm oil refining industry is disclosed herein [1,2]. This active catalytic system provided a maximum conversion of 95% to fatty acid ethyl esters (FAEEs), using a 1:30 DDPO: EtOH molar ratio, at 130 ° C for 2 h, with 4% catalyst. In these conditions, this catalyst was highly efficient even after successive reuses (>73%). Reuse resulted in a decrease in conversion, probably due to the deactivation induced by the adsorption of unsaponifiable organic compounds or the leaching (<10%) of active sites on the surface of AlSiM [3]. The catalyst proved to be highly promising in the esterification of residual FFAs, stable and easily recyclable without substantial loss of activity, which makes it attractive and ecological for the esterification reaction of residual FFAs. In addition, the catalytic performance resulted in a good conversion in the esterification reaction of DDPO, in relation to other heterogeneous catalysts. This approach represents a valuable and promising contribution to existing processes used not only for the synthesis of renewable biofuels, but for other transformations of residual biomass. The reuse of industrial by-products such as FK and DDPO in the synthesis of products of high commercial value, adding value to industrial by-products, makes production sustainable from both economic and environmental perspectives.

FIGURES

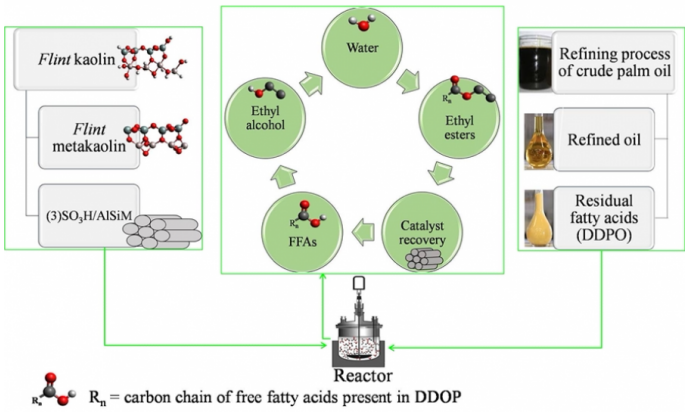

FIGURE 1

Scheme 1

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FIGURE 2

KEYWORDS

crude palm oil | mesoporous (3)SO3H/AlSiM catalyst | fatty acid | esterification

BIBLIOGRAPHY