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Esterification of free fatty acids over chitosan with sulfonic acid groups

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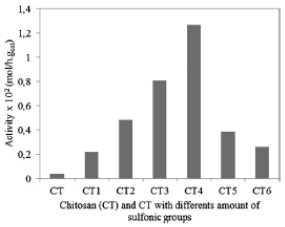
HIGHLIGHTS

- Sulfonic acid catalysts supported on chitosan were prepared.
- Esterification of fatty acids was carried out over chitosan with sulfonic groups.
- High catalytic activity was observed.

GRAPHICAL ABSTRACT



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ABSTRACT

Chitosan, which is an abundant biopolymer, with sulfonic acid groups was used as an efficient, environmentally friendly heterogeneous catalyst for the esterification of free fatty acids with methanol into their more fatty acid methyl ester. Sulfonic acid catalysts supported on chitosan have been studied in the esterification of palmitic acid with methanol at 60 °C. The sulfonic acid groups were introduced onto chitosan (CT) through cross-linking with sulfosuccinic acid (SSA). The catalytic activity increased as the amount of sulfonic acid groups present in chitosan was increased. However, with large amounts of sulfonic acid groups, the catalytic activity decreased. This behaviour can be explained by the factors that limit the diffusion. The catalytic stability of the CT4 (2.08 mmol sulfonic acid groups/g) sample was evaluated through consecutive batch runs performed with the same catalyst sample. After the second batch, the catalytic activity stabilised. The CT4 catalyst was also used as a catalyst in the esterification of oleic and stearic acids with methanol. A good catalytic activity of CT4 for the different substrates used in the esterifications was observed.