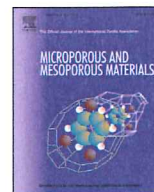




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Tungstophosphoric acid immobilised in SBA-15 as an efficient heterogeneous acid catalyst for the conversion of terpenes and free fatty acids

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ABSTRACT

Alkoxylation of α -pinene, β -pinene and limonene was performed in the presence of SBA-15-occluded tungstophosphoric acid (HPW). The HPW was immobilised in SBA-15 using the sol-gel method. The catalysts were characterised by N₂ adsorption, FT-IR, Raman spectroscopy, X-Ray diffraction, ICP-AES and TEM. A series of catalysts with different heteropolyacid loadings ranging from 1.8 to 19.3 wt. % were prepared. PW4-SBA-15 (with 10.8 wt. %) exhibited the highest catalytic activity for the alkoxylation of α -pinene with ethanol. An approximately 53% selectivity to α -terpinyl ethyl ether was observed over the PW-SBA-15 catalysts. PW4-SBA-15 was also used as a catalyst for the alkoxylation of other terpenes, including β -pinene and limonene. The PW4-SBA-15 catalyst exhibited high catalytic stability for the alkoxylation of α -pinene with ethanol.

PW4-SBA-15 was also used as a catalyst for the esterification of free fatty acids (i.e., palmitic, stearic and oleic acids) with ethanol. Good catalytic activity was observed for the PW4-SBA-15 catalyst with the different substrates used in the esterifications.

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