Institute of Chemical Engineering

Bifunctionalised acid-base hierarchically structured monolithic microreactor for continuous-flow tandem catalytic process of cyanocinnamate synthesis

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The results on zirconia-amine bifunctional modification of hierarchically porous silica monoliths for continuous-flow processes ar presented. The study reports the synthesis and properties of the modified porous monoliths and their performance in the tandem process of deacetalization-Knoevenagel condensation reaction. The properties of the materials were studied by thermal analysis, FTIR spectroscopy, XRF and nitrogen adsorption. It was found that both active centres were uniformly distributed along the monolithic cores, and the antagonistic interaction of the acid and base centres was not observed. It was shown that hydrophobicity of the monolith surface has opposite effects on the efficiency of the studied reactions. The overall rate of the tandem process depends on the rate of the condensation reaction. The performance of the bifunctional microreactors was checked and compared with those of cascade-connected monofunctional microreactors and batch reactor. The yield of cyanocinnamate product obtained in both flow systems was ca. 78%; however, pressure drop in the bimodified reactor was only half of that in the cascade. An effective way of water supply to the reaction system has been proposed. The research demonstrates the benefits of using flow-through structured micro-/mesoreactors in tandem reaction processes.

Metryczka

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