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Catalytic cracking of stearic acid over Pd supported over nanocrystalline and hierarchical HZSM-5

M Arroyo, D P Serrano, J M Escola and L Briones
Rey Juan Carlos University, Spain

Recently, hydroconversion of triglycerides to produce hydrocarbons has been considered as an alternative way to produce high quality fuels, but it has the considerable drawback of requiring hydrogen. Catalytic cracking of vegetable oils appears as a possible alternative to obtain biofuels in the absence of hydrogen. In the present work, Pd supported over nanocrystalline (Pd/n-ZSM-5) and hierarchical ZSM-5 (Pd/h-ZSM-5) were tested in the catalytic cracking of stearic acid, which is a fatty acid usually present in the makeup of vegetable oils. These supports were chosen because of their strong acidity and high external surface/mesoporosity which enhanced the accessibility toward the acid sites. Additionally, Pd was incorporated since this metal favours decarboxylation and hydrogenation / dehydrogenation reactions, which are highly desirable for the preparation of biofuels. The catalytic experiments were carried out in autoclave reactor and the solution of 10 wt% stearic acid in dodecane was used as feedstock. The reactions were carried out below 6 bar of nitrogen, at different temperatures and reactions times. Pd/h-ZSM-5 almost doubled the conversion of stearic acid with regard to Pd/n-ZSM-5 (67 vs. 33 %), pointing out that the remarkable properties of hierarchical supports in terms of accessibility really pays off. Additionally, this catalyst outperforms Pd/n-ZSM-5 not only in the attained conversion but also in the selectivity, since higher gasoline share was attained. Consequently, Pd/h-ZSM-5 was a better catalyst than Pd/n-ZSM-5 for the cracking of stearic acid.

Biography

M Arroyo is currently pursuing her PhD in the Rey Juan Carlos University (Spain) in which she is working in the development of heterogeneous acid catalysts for the conversion of plastic wastes and biomass derived oils into fuel. During this period she will undertake a Pre-doctoral research in the group of Prof. Adam Lee and Karen Wilson in European Bioenergy Research Institute (Birmingham) in bio oil esterification. At the same time, she has different graduate teaching responsibilities at Rey Juan Carlos University.

marta.arroyo@urjc.es

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