



## Esterification of fatty acids to biodiesel over polymers with sulfonic acid groups

C.S. Caetano<sup>a</sup>, L. Guerreiro<sup>b</sup>, I.M. Fonseca<sup>b</sup>, A.M. Ramos<sup>b</sup>, J. Vital<sup>b</sup>, J.E. Castanheiro<sup>a,\*</sup>

<sup>a</sup>Centro de Química de Évora, Departamento de Química, Universidade de Évora, 7000-671 Évora, Portugal

<sup>b</sup>REQUIMTE/CQFR, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, 2829-516 Caparica, Portugal

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### ABSTRACT

The esterification of palmitic acid with methanol was studied using poly(vinyl alcohol) cross-linked with sulfosuccinic acid (SSA) and polystyrene cross-linked with divinylbenzene with sulfonic acid groups, as catalysts, at 60 °C. It was observed that the PVA matrixes with sulfonic acid groups were more active than the polystyrene ones. With the most active polymeric matrix (PVA\_SSA40), an almost 90% equilibrium conversion was achieved after 2 h.

Further, the optimisation of reaction parameters, such as, catalyst loading, molar ratio alcohol to fatty acid and type of alcohol was carried out with PVA\_SSA40 catalyst.

Catalytic stability of the PVA\_SSA40 was evaluated by performing consecutive batch runs with the same catalyst sample. After the second batch, a stabilisation of the catalytic activity was observed.

The PVA\_SSA40 was also used as catalyst in the esterification of oleic and stearic acid with methanol, having been obtained an equilibrium conversion of almost 80%.

In order to become the biodiesel totally biogenerated, the esterification of palmitic acid was carried out with ethanol, at 60 °C and 80 °C. It was observed that the reaction rate is slower when the reaction is carried out with methanol, at 60 °C.

In a posterior catalytic experiment at 60 °C, PVA\_SSA40 showed catalytic activity to obtain biodiesel from animal fats (lard), in the presence of methanol.

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