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Hydrolysis of sucrose using sulfonated poly(vinyl alcohol) as catalyst

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ABSTRACT

The hydrolysis of sucrose was carried out over poly(vinyl alcohol) (PVA) with sulfonic acid groups, at 80 °C. The products of sucrose hydrolysis were glucose and fructose. A series of PVA with different crosslinking degree were prepared. It was observed that the catalytic activity of PVA matrix increases with the crosslinking degree, due to the increases of the amount of sulfonic acid groups on PVA.

Further, the influence of various reaction parameters, such as, catalyst loading, initial concentration of sucrose and temperature, on the hydrolysis of sucrose over PVA₄₀ was studied. It was found that at 80 °C, with 0.511 g of catalyst loading and with an initial concentration of sucrose of 0.6 M, a sucrose conversion of about 90%, after 3 h, could be obtained.

The PVA₄₀ catalyst was recycled and reused with negligible loss in the activity.

A simple kinetic model was developed assuming that the sucrose hydrolysis is an irreversible reaction and the first order with respect to the sucrose concentration. Since the concentration profiles of the reactant and the products do not exhibit any pronounced initial inductive period, the external and internal diffusion of the reactant and products on the catalyst were not considered. It was observed that the kinetic model fits experimental concentration data quite well.

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