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Intensification of mass and heat transfer at the bottom of a stirred tank reactor by a horizontal tubular baffle

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Abstract

In an attempt to obviate the costly and protracted separation of final products from powdered catalyst particles in stirred slurry catalytic reactors, the electrochemical technique was used in the present study to determine mass transfer in a stirred vessel equipped with different baffle configurations placed at the tank bottom. Additionally, the effect of baffle tube diameters, as well as the impeller speed and geometry were examined. Mass transfer data obtained were correlated using the governing dimensionless groups from which heat transfer rates can be deduced by analogy. Results revealed the merits of using tubular baffles in terms of mass transfer and consequently heat transfer enhancement. Besides acting as a catalyst support where liquid-solid diffusion-controlled catalytic reactions, electrochemical reactions, photochemical reactions, and immobilized enzyme-catalyzed biochemical reactions take place, a tubular baffle can act also as a built-in cooler, in case of highly exothermic reactions to avoid hot spots and catalyst deactivation.

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