Catalysis in Industry 2014 vol.6 N4, pages 283-291

Diffusion model of the dehydrogenation of isoamylenes into isoprene in a fixed iron-potassium catalyst bed

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Abstract

© Pleiades Publishing, Ltd., 2014. © A.G. Egorov, Kh.Kh. Gilmanov, A.A. Lamberov, P.V. Urtyakov, 2014. A mathematical model is suggested for the dehydrogenation of isoamylenes into isoprene in a fixed bed of industrial, self-regenerating, iron-potassium catalysts (KDOM and ZhKD). The model takes into account the size and shape of catalyst granules, the rate constants and activation energies of the forward (dehydrogenation) and reverses (hydrogenation) reactions, those of cracking and catalyst self-regeneration reactions, and the buildup of leachable and nonleachable coke. The mathematical model adequately describes the physical and chemical processes occurring in the dehydrogenation of isoamylenes in industrial reactors at different amounts of iron-potassium catalyst and varied reactor operation parameters (feed flow rate, degree of dilution of the feedstock with water vapor, temperature and pressure at the reactor inlet. It provides means to optimize the technological parameters of the industrial process.

http://dx.doi.org/10.1134/S2070050414040084

Keywords

Dehydrogenation of isoamylenes, Diffusion model, Iron-potassium catalyst, Isoprene, Mathematical modeling