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Catalytic Functionalized Structured Monolithic Micro-/Mesoreactors: Engineering, Properties, and Performance in Flow Synthesis: An Overview and Guidelines

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In this review article, we first discussed the development of silica monoliths with hierarchical macro-/mesopore structure and their potential figures of merit as continuous-flow micro-/ mesoreactors of up to 30 ml working volume. Making use of the flow hindrance of different pore structures seen from the Darcy law perspective, we discriminated four structures of the monoliths (M1–M4). We then summarized the most important results, mainly from our studies of continuous-flow structured monolithic reactors and rotating bed reactors (RBRs) filled with structured pellets, activated with various catalytic entities and enzymes. The results show that an increase in the flow rate and thus velocity in reactors activated with more conventional catalytic sites has no or a minor positive effect on the apparent reaction rate. On the contrary, in those with the most open structure (M1) and functionalized with enzymes, it could increase by more than two orders of magnitude even at low overpressures. The production systems worked stably for at least 200 h. To conclude, the synthetic system made of the hierarchically structured monoliths, or RBRs filled with structured catalytic pellets, lay the foundation for a new platform for the high-yield production of a wide variety of specialty chemicals, even on a multikilogram scale, in a safe and sustained manner.

Metryczka

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