

547b Microfibrous Supported Catalysts/Sorbents – Micro Structured Systems with Enhanced Contacting Efficiency

Ranjeeth Kalluri, Donald Cahela, and Bruce Tatarchuk

An innovative contacting system involving Microfibrous Supported Catalysts/Sorbents (MSCS) showed higher reaction rates compared to packed beds and monoliths. High voidages and ease of pleating microfibrous media helped reduce the pressure drop considerably. MSCS systems use 50-300 micron in diameter catalyst/sorbent particles entrapped within a microfibrous matrix. The radial micro mixing and elimination of channeling achieved using this micro-structured material lead to better utilization of catalysts. Choice of metal, polymer or ceramic microfibers can be made depending on the operating conditions of the application.

MATLAB simulations were performed on a first order reaction system to compare head-to-head performance attributes of a: packed bed, monolith and flow-through pleated microfibrous entrapped catalyst layer. These results show that higher reaction rates and conversions per unit pressure drop compared to conventional reactors can be achieved using MSCS. The effect of fiber diameter, voidage and catalyst particle size on performance of MSCS was explored. The simulation and experimental results are found to be in good agreement. Experimental results from hexane adsorption and catalytic ozone decomposition will be used to demonstrate the potential for use of MSCS in heterogeneous catalysis and adsorption applications.