Integrated Microreactor System

H.R. Sahoo, E.R. Murphy, A. Guenther, N. Zaborenko, K.F. Jensen
Sponsorship: Deshpande Center for Technological Innovation

The realization of integrated microchemical systems will revolutionize chemical research by providing flexible tools for rapid screening of reaction pathways, catalysts, and materials synthesis procedures, as well as faster routes to new products and optimal operating conditions. Moreover, such microsystems for chemical production will require less space, use fewer resources, produce less waste, and offer safety advantages. The need for synthesizing sufficient quantities of chemicals for subsequent evaluation dictates that microchemical systems are operated as continuous systems. Such systems require fluid controls for adjusting reagent volumes and isolating defective units. The integration of sensors enables optimization of reaction conditions as well as the extraction of mechanistic and kinetic information.

We are developing integrated microchemical systems that have reactors, sensors, and detectors with optical fibers integrated on one platform. We are exploring new approaches for connecting modular microfluidic components into flexible fluidic networks. Real-time control of reaction parameters using online sensing of flowrate, temperature, and concentration allows for precise attainment of reaction conditions and optimization over a wide range of temperatures and flow-rates. The multiple microreactors on the system can be used together to give higher throughputs or they can be used independently to carry out different reactions at the same time. Figure 1 shows a schematic of an integrated microreactor platform along with an early stage microreactor “circuit board” [1].

REFERENCE