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Microchemical Platforms for Efficient Chemical Processing

Professor Ronald S. Besser
Chemical, BioMedical and Materials Engineering
Stevens Institute of Technology

ABSTRACT

Miniaturization has revolutionized many technological areas in the past decades and has given us many products and services that we now consider routine. At a slower pace has been the development of miniature systems for *chemical processing*. Although analytical applications in biomedicine, such as lab-on-a-chip, have been well publicized, less well known are microchemical systems for the *production* of chemicals. Because of microscale geometry these systems can possess extraordinarily high rates of heat and mass transport, enabling unprecedented levels of processing efficiency as measured by such figures of merit as conversion, selectivity, space-time velocity, etc. on a per volume basis. Our group has been involved in understanding the crucial issues and fundamental limitations of such systems in a variety of applications. The presentation will highlight a few examples of these applications, especially in the areas of hydrogen generation for portable fuel-cell powered systems, and in pharmaceutical synthesis where high conversion and selectivity can significantly improve manufacturing efficiency by reducing purification steps for product isolation.

BIOGRAPHY

Dr. Besser is a professor of chemical engineering at Stevens Institute of Technology in Hoboken, New Jersey. Prior to joining Stevens in 2002, he was associate professor and group leader at the Institute for Micromanufacturing at Louisiana Tech University in Ruston, Louisiana. He is co-director and a core researcher at the New Jersey Center for Microchemical Systems, a Stevens center which is dedicated to leadership in understanding and developing microchemical systems. Besser's current research focuses on microchannel reaction environments for various chemical applications including processing of hydrocarbons into clean hydrogen for fuel cells and hydrogenation of pharmaceutical compounds. Prior to entering academia, he spent several years working in Silicon Valley industry in microfabrication and microelectronic materials and device development. Dr. Besser holds the B.S. degree in chemical engineering from U.C. Berkeley, and the M.S. and Ph.D. degrees in Materials Science and Engineering from Stanford University. He has more than one hundred technical publications and patents.