E. G. MOSCHETTA, S. NEGRETTI, K. M. CHEPIGA, N. A. BRUNELLI, Y. LABRECHE, Y. FENG, F. REZAEI, R. P. LIVELY, W. J. KOROS, H. M. L. DAVIES,* C. W. JONES*
(GEORGIA INSTITUTE FOR TECHNOLOGY AND EMORY UNIVERSITY, ATLANTA, USA)
Composite Polymer/Oxide Hollow Fiber Contactors: Versatile and Scalable Flow Reactors for Heterogeneous Catalytic Reactions in Organic Synthesis
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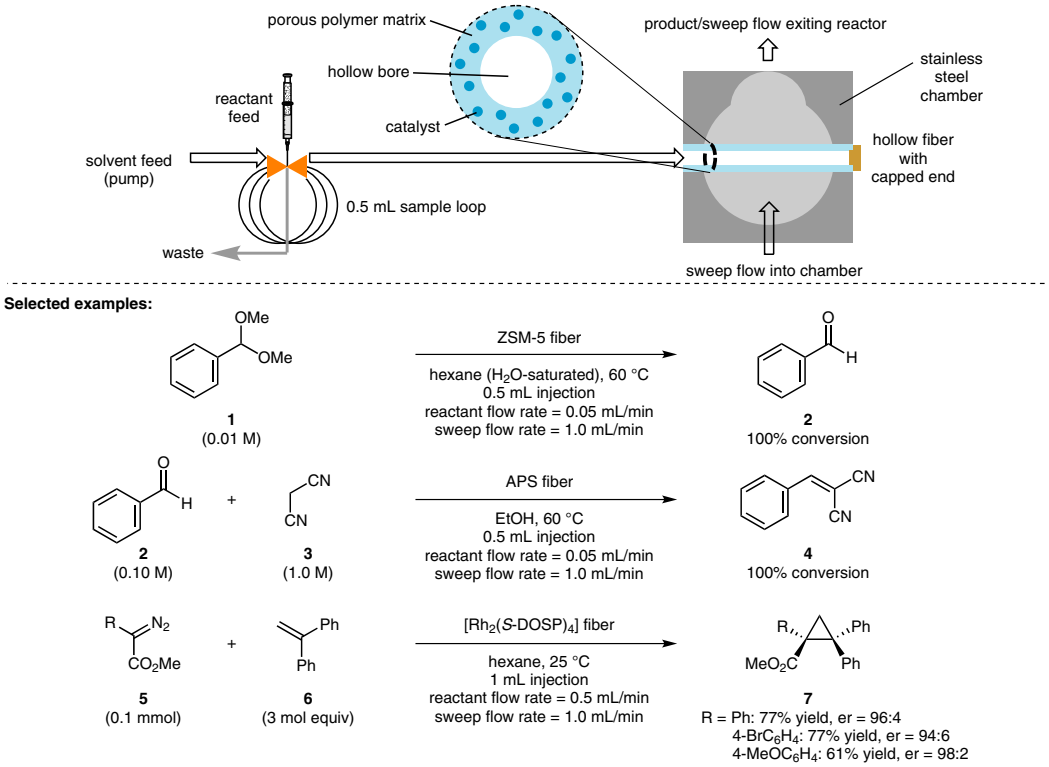
Flow Reactors Using Hollow Fibers for Acid, Base, or Chiral Rhodium Catalysis



Significance: Flow reaction systems using composite hollow cellulose acetate fibers containing embedded catalysts {ZSM-5 (aluminosilicate MFI zeolite), 3-aminopropyl (APS)-functionalized silica, and the immobilized analogue of Rh_2(*S*-DOSP)$_4$ [DOSP = *N*-(4-dodecylphenylsulfonyl)prolinato]} were developed for heterogeneous catalytic reactions. The acid-catalyzed hydrolysis of (dimethoxymethyl)benzene (**1**) to benzaldehyde (**2**) on ZSM-5/fiber, the Knoevenagel condensation of benzaldehyde (**2**) with malononitrile (**3**) on APS fiber, and a rhodium-catalyzed enantioselective cyclopropanation on the Rh_2(*S*-DOSP)$_4$ fiber all proceeded efficiently.

Comment: The catalysts were embedded within the permeable fiber walls (approximately 300–400 µm thick), and the reactants were fed through the bores of the composite hollow fibers. The fiber was surrounded by a sweeping flow of organic solvent that facilitated product collection. The fiber was capped at the end furthest from the inlet to ensure the reactants flowed through the walls and contacted to the catalyst.

SYNFACTS Contributors: Yasuhiro Uozumi, Yoichi M. A. Yamada, Takuma Sato
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Category
Polymer-Supported Synthesis

Key words
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heterogeneous catalysis
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rhodium