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Kockmann, Norbert ; Brand, Oliver ; Fedder, Gary K ; Hierold, Christofer ; Korvink, Jan G ; Tabata, Osamu ; Brand, Henry

Weinheim: John Wiley & Sons, Incorporated 2006

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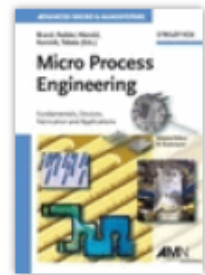
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# Micro Process Engineering: Fundamentals, Fabrication, and Applications

Editor(s): Dr.-Ing. Norbert Kockmann

First published: 6 February 2006

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This edition of 'Micro Process Engineering' was originally published in the successful series 'Advanced Micro & Nanosystems'.

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# 1 Process Engineering Methods and Microsystem Technology

*Norbert Kockmann, Laboratory for Design of Microsystems, Department of Microsystem Engineering (IMTEK), University of Freiburg, Germany*

### Abstract

The fundamentals of chemical engineering are presented with the aim of applications in microsystem technology, microfluidics, and transport processes in microstructures. After a general overview about both disciplines and common areas the concept of unit operations is briefly introduced. The balance equations are derived from statistical mechanics and applied to other relevant systems of process engineering together with the kinetic description of main transfer processes. Engineering tools like dimensional analysis, order of magnitude estimations, or lumped element modeling are explained, which are very helpful for dealing with complex nonlinear systems. Concluding this chapter, the benefits and limits of miniaturization of various unit operations and typical issues are explained that might serve as a plentiful source for the future development.

### Keywords

Unit operations, balance equations, transport equations, engineering modeling, scaling process

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