AIChE JOURNAL

VOL.46, NO.12 DECEMBER 2000

The AIChE JOURNAL, a monthly publication of the American Institute of Chemical Engineers, is devoted to fundamental research and developments having immediate or potential value in chemical engineering.



Editor Stanley I. Sandler

Managing Editor Haeja Lim Han

Associate Editors Mark A. Barteau Edward L. Cussler Ignacio Grossmann

Julio M. Ottino Charles F. Zukoski

Copy Editor Arthur H. Baulch

Editorial Assistant Jeff Karpinos

Cover Design Fran Fresquez

Consulting Editors
Rakesh Agrawal
Separation Processes

Juan de Pablo Computational Research

L. S. Fan Particle Technology

Alice P. Gast Materials

Carol K. Hall
Thermodynamics

Eric W. Kaler Colloidal Phenomena

George E. Keller, II Separations

Michael T. Klein Reaction Engineering

Frederick J. Krambeck Reactor Engineering

Douglas A. Lauffenburger Bioengineering

Glen H. Pearson

Materials Processing

Ronald W. Rousseau *Crystallization*

John Seinfeld Environmental Engineering

Michael Shuler Biochemical Engineering

Publisher Stephen R. Smith

Marketing Manager Lois Anne DeLong AICHE Journal (ISSN 0001-1541) is published monthly by the American Institute of Chemical Engineers, Three Park Avenue
New York, NY 10016-5991.

Manuscripts should be submitted to the AIChE Journal Editorial Office Dept. of Chemical Engineering University of Delaware Newark, DE 19716-3110 Tel 302.831.6858 Fax 302.831.3226. E-mail: aichei@che.udel.edu

The statements and opinions in the AIChE Journal are those of the contributors, and AIChE assumes no responsibility for them.

Annual subscription rates are as follows.

Print version:
N. American members, \$99
International members, \$179
N. American student members, \$55
International student members, \$135
N. American nonmembers, \$830
International nonmembers, \$940

Online version only: Members, \$135 Student members, \$90 Nonmembers, \$950

Print version plus Online: N. American members, \$150 International members, \$230 N. American student members, \$110 International student members, \$190 N. American nonmembers, \$1,150 International nonmembers, \$1,230

Single print copy:
North American members, \$21
International members, \$29
N. American student members, \$29
International student members, \$37
N. American nonmembers, \$99
International nonmembers, \$107

For subscription, e-mail: xpress@aiche.org or phone: 1-800-242-4363 (Toll Free) or 1-212-591-8100

Postage for domestic and international mailing paid at New York City and additional mailing offices.

Copyright © 2000 by the American Institute of Chemical Engineers.

POSTMASTER: Send change of addresses to *AIChE Journal* Three Park Avenue New York, NY 10016-5991.

Authorization to photocopy items for internal or personal use, or the internal or personal use, or the internal or personal use of specific clients, is granted by AIChE for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that a fee of \$19.00 per article is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923.

This consent does not extend to copying for general distribution, for advertising or promotional purposes, for inclusion in a publication, or for resale.

Articles published before 1988 are subject to the same copyright conditions. *AIChE Journal* fee code: 0001-1541/00 \$15.00 per article.