

# AICHE JOURNAL

JANUARY 1980 • VOL. 26, NO. 1

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

#### PUBLISHER

J. C. Forman

#### PUBLICATIONS DIRECTOR

Larry Resen

#### EDITOR

Robert H. Kadlec

#### PRODUCTION EDITOR

Maura Mullen

#### TECHNICAL EDITOR

Patricia Lane

#### EDITORIAL ASSISTANT

Barbara T. Lynn

#### EDITORIAL BOARD

R. Dale Biggs

K. C. Chao

James M. Douglas

George R. Gavalas

L. Louis Hegedus

Maurice A. Larson

Dan Luss

Daniel D. Perlmutter

Joseph A. Polack

W. R. Schowalter

Kenneth A. Smith

Stephen Whitaker

Publication Office, 215 Canal Street, Manchester, New Hampshire. Published in January, March, May, July, September, and November by the American Institute of Chemical Engineers, 345 East 47 Street, New York, New York 10017. (ISSN 0001-1541) Manuscripts should be submitted to Robert H. Kadlec, Editorial Offices, Room 3036, East Engineering Building, The University of Michigan, Ann Arbor, Michigan 48109. Statements and opinions in the *AIChE Journal* are those of the contributors, and the American Institute of Chemical Engineers assumes no responsibility for them. Subscription: one year, \$70; special member rate, \$12; additional yearly postage, Canada \$4.00, Pan American Union \$5.00, other foreign \$5.00 (foreign subscriptions payable in advance). Single copies: \$16.50. Single copies more than one year old: \$17.50. Second-class postage paid at New York, N. Y. and additional mailing offices. Copyright 1980 by the American Institute of Chemical Engineers. National headquarters of AIChE is concerned about nondelivery of copies of the *AIChE Journal* and urgently requests subscribers to give prompt notification of any change of address. Sixty days must be allowed for changes to be made in the records.

Postmaster: Please send form 3579 to *AIChE Journal*, 345 East 47 Street, New York, N. Y. 10017.

## AIChE Symposium Series

### Recent Studies

**S-192. Recent Advances in Separation Techniques II.** Separation technology and science are becoming increasingly important due to the shortage of energy and raw materials. The papers in this volume address themselves to these factors, such as, the need to improve and modify separation techniques and processes to economically produce raw materials and lower energy consumption.

1980. 111 pp. AIChE members, \$7.50; nonmembers, \$20

**S-193. Design, Control and Analysis of Crystallization Processes.** The work presented in this volume broadly divides into two themes, namely design-analysis-control and crystallization kinetics. The work reported is current and accurately reflects on-going academic research efforts in crystallization.

1980. 97 pp. AIChE members, \$7.50; nonmembers, \$20

**S-194. Hazardous Chemicals—Spills and Waterborne Transportation.** This volume is comprised of papers presented at the AIChE 87th National Meeting in Boston in conjunction with the U.S. Coast Guard. The papers consist of methods in dealing with hazardous chemical spills, waterborne transportation of hazardous chemicals and synthetic and wire ropes for ocean systems.

1980. 147 pp. AIChE members, \$8.50; nonmembers, \$20

Order from American Institute of Chemical Engineers, 345 East 47 Street, New York, New York 10017.

ASK FOR THE AIChE PUBLICATIONS CATALOG.

#### Reproducing copies

The appearance of the code at the bottom of the first page of an article in this journal indicates the copyright owner's consent that for a stated fee copies of the article may be made for personal or internal use or for the personal or internal use of specific clients. This consent is given on the condition that the copier pay the per-copy fee (appearing as part of the code) through the Copyright Clearance Center, Inc., P.O. Box 765, Schenectady, N.Y. 12301, for copying beyond that permitted by Sections 107 or 108 of the U.S. Copyright Law. 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 1978 are subject to the same copyright conditions, except that the fee is 75 cents for each article.