

A IChE JOURNAL

JANUARY 1982 • VOL. 28, 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

MANAGING EDITOR

Maura Mullen

TECHNICAL EDITOR

Haeja L. Han

EDITORIAL ASSISTANT

Barbara T. Lynn

EDITORIAL BOARD

Alan J. Brainard
Coleman B. Brosilow
L. Louis Hegedus
Joseph D. Henry, Jr.
Robert L. Kabel
Maurice A. Larson
Daniel D. Perlmutter
Joseph A. Polack
Roger A. Schmitz
W. R. Schowalter
Stephen Whitaker

Publication Office, 20th and Northampton Streets, Easton, Pa. 18042. 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, \$85; special member rate, \$16; additional yearly postage outside U.S.A. \$5 (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 1982 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 209—Water 1980. This volume contains the most significant water pollution papers presented at AICHe meetings in 1980. The papers deal with energy conservation, and wastewater treatment and other topics of current importance.

1981. 344 pp. AICHe members \$18. others \$36

S 210 Fundamentals and Applications of Solar Energy—Part II. The papers in this volume cover a wide range of fundamental and applied research including thermal storage, solar cells and generation, industrial applications, manufacturing and biomass utilization.

1981. 96 pp. AICHe members \$15; others \$30

New Prepayment Policy: Effective January 1, 1981.

Check or money order *must* accompany all U.S. orders for less than 10 books. We will honor bill-and-ship invoices and the purchase orders on U.S. orders for 10 or more books only. There will be no charge for postage or handling on U.S. orders when shipped book rate. All foreign orders (regardless of quantity) must be accompanied by remittance and must be paid in U.S. dollars. Include \$1.00 per book to cover postage and handling. Proforma invoice on request. All publication sales are final.

Orders from Publications Sales, Dept., M, 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 \$2.00 for each article.