ADVANCES IN

CHEMICAL ENGINEERING

Editor-in-Chief JAMES WEI

Department of Chemical Engineering Massachusetts Institute of Technology Cambridge, Massachusetts

Editors

JOHN L. ANDERSON

Department of Chemical Engineering Carnegie-Mellon University Pittsburgh, Pennsylvania

KENNETH B. BISCHOFF

Department of Chemical Engineering University of Delaware Newark, Delaware

JOHN H. SEINFELD

Department of Chemical Engineering California Institute of Technology Pasadena, California

Volume 15



ACADEMIC PRESS, INC.

Harcourt Brace Jovanovich, Publishers

San Diego New York Boston London Sydney Tokyo Toronto