the deposition reactions. The deposited films are then analyzed for electrical and physical properties. Through cooperation with local industries the students fabricate devices using the latest thin film technology. Other students are using CSU's kinetic results to model the behavior of industrial reactors. Again, local industries cooperate by allowing the comparison between our models' predictions and their deposition results.

The Department of Chemistry actively participates along with the previously mentioned departments in Colorado State University's Condensed Matter Sciences Laboratory. Current research activities include the study of molecular condensed phases (E. R. Bernstein), electrode surface modification (C. M. Elliott), techniques of elemental analysis and the chemical characterization of surfaces (D. E. Leydon), and NMR studies of solids (G. E. Maciel).

CONCLUSIONS

Chemical engineers are currently contributing to the electronics industry in growing numbers. Colorado State University has responded to industry demand for chemical engineers by offering a graduate program emphasizing integrated circuit processing. The program utilizes courses from several departments while allowing the student to apply chemical engineering techniques to an integrated circuit fabrication research topic. Graduates are receiving multiple offers from top quality semiconductor companies throughout the United States. □

ChE book reviews

COMPUTATIONAL METHODS FOR TURBULENT, TRANSONIC, AND VISCOUS FLOWS

Edited by J. A. Essers
Hemisphere Publishing Corp., 1983; 360 pages, $49.95

Reviewed by G. K. Patterson
University of Arizona

This book consists of six contributions in the general field of numerical simulation of turbulent flows. Each article is a strong contribution on the topic covered. Those topics are: "Numerical Methods for Coordinate Generation Based on a Mapping Technique," by R. T. Davis; "Introduction to Multigrid Methods for the Numerical Solution of Boundary Value Problems," by W. Hackbusch; "Higher-Level Simulations of Turbulent Flows," by J. H. Ferziger; "Numerical Methods for Two- and Three-Dimensional Recirculating Flows," by R. I. Issa; "The Computation of Transonic Potential Flow," by T. J. Baker; and "The Calculation of Steady Transonic Flow by Euler Equations with Relaxation Methods," by E. Dick.

To the novice attempting to learn the basics of numerical turbulence simulation, the organization of the book is not optimum. Although it is logical thematically to present grid generation, multigrid solution methods, and higher-level simulation in the first half of the book to lay a theoretical basis for the more practical topics to follow, the novice would feel more comfortable reading first about general methods for Reynolds-averaged modeling as presented for recirculating flows and transonic flows in the fourth through sixth chapters.

The book offers much to those who already have some knowledge of numerical simulation of turbulent flows. The treatment is not general and comprehensive for the entire turbulent and transonic flow modeling field. Each chapter presents a rather narrow topic from the author's particular viewpoint. Even though the collection represents the notes for a course presented at the von Karman Institute, no effort was made to link the presentations. Indeed, only one chapter was supplied with a nomenclature list, and each chapter has a different set of symbols.

The book would be valuable to those with some familiarity with numerical simulation of flow but without expertise in numerical modeling of turbulent, transonic flow. They should probably read the chapters in the order: 4, 5, 6, 2, 1, 3. That order corresponds to problem complexity and so is easier for non-experts. The book probably does not present much in each topic that an expert on that topic does not already know, so it should not be expected to provide much that is new if only that chapter is read. Its value is in its possible introduction of experts in one field, say coordinate generation and mapping, to another field where that expertise can be used, say external, transonic, turbulent flows. Having known little about transonic flows but much about incompressible turbulent flow modeling, I learned much from the last two chapters. □