BOOK REVIEWS

Selection of books for review is based on the editors' opinions regarding possible reader interest and on the availability of the book to the editors. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

Cooling Tower Environment—1974

Coordinators	Steven R. Hanna and Jerry Peel
Publishers	U.S. Energy Research and Development Administration, Technical Information Center, Office of Public Affairs
Pages	638
Price	$13.60
Reviewer	John D. Randall

Cooling Tower Environment—1974 is the proceedings of a symposium held at the University of Maryland Adult Education Center in March 1974. It is published in the U.S. Energy Research and Development Administration Symposium series and is available as CONF-740302 from the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 22161.

Most proceedings of conferences or meetings generally present a random assortment of topics, often having little in common. If one has an interest in a particular topic presented at a conference, he might be better off to request a copy of the paper directly from the author. This is not the case with *Cooling Tower Environment—1974.* The technical program of the conference appears to have been extremely well put together by Steven R. Hanna and Jerry Peel, the symposium coordinators. The first paper, which is tutorial in nature, is entitled "Environmental, Economic, and Social Considerations in Selecting a Cooling System for a Steam Electric Generating Plant." This paper by Amiram Roffman of the Westinghouse Environmental Systems Department discusses the importance of the operating characteristics of a cooling system in the site selection. The paper reviews the many factors involved that must be considered in selecting and operating a satisfactory cooling system. It also describes an evaluation scheme that enables one to assign numerical values to the various features of a cooling system to reach a decision as to the optimum location.

A large variety of topics are considered and well presented in the book, which contains over 600 pages and includes 29 different papers. A selection from the list of topics includes the optimum design of dry/wet cooling towers, flume recirculation and interference, flume rise from multiple sources, drift management, comparison of wind tunnel analysis with experimentation, and the effects of airborne salt, environmental effects of chromium and zinc, drift particle characteristics, drift deposition rates, and an overview of several programs designed to evaluate the total cooling program. Some of the papers present mathematical modeling of cooling tower characteristics. Others outline experimental techniques, giving excellent details of the instrumentation and techniques used. A significant part of the book is devoted to the use of saltwater in the cooling systems. Papers concerned with saltwater include "Test Program on the Environmental Effects of Salt Water Mechanical Cooling Devices" and a 50-page comprehensive review of the studies of the application of natural draft cooling systems at the Fork River Nuclear Generating Center Station in New Jersey. Analytic techniques are presented for the prediction of salt deposition rates from cooling systems that use saltwater.

A copy of *Cooling Tower Environment—1974* should be in the library of every steam generating utility whether or not they are nuclear. For the novice the book is sufficiently comprehensive to provide a broad background in the subject matter. For the expert it represents a valuable source book of recent research. Each paper provides extensive references that would enable a detailed literature search into a specific topic. Though it is a collection of many papers, the language style is remarkably uniform and readable.

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University. He has been active in the Reactor Operations Division of the American Nuclear Society, where he recently completed a term as chairman of the Division. He has authored or co-authored over 40 publications concerned with radiation detection and reactor operations.

Treatise on Materials Science and Technology: Plastic Deformation of Materials--Volume 6

Editor	R. J. Arsenault
Publisher	Academic Press, Inc.
Date	May 1975
Pages	504
Price	$45.00
Reviewer	Louis J. Demer

Plastic deformation is a very important and fertile branch of materials science. This book reviews some of the great profusion of ideas on plastic deformation that have been put forward over the years. The seven chapters, written by experts in their fields, describe the mechanisms of plastic deformation of metals, crystalline nonmetals, and polymers in the temperature range from near absolute zero to the melting temperature of the material in question. The goal was to analyze the important developments in each area and to place them in a modern perspective. The concept of dislocations is used to account for the low observed levels of stress needed to achieve permanent deformation. This enables discussion of the development of theories of dislocation dynamics and the testing of these theories against observed stress-strain curves for a large variety of crystalline materials. The book contains more than 1000 references.

The low-temperature deformation of body-centered cubic (bcc) metals and their solid solution alloys is the subject of the first chapter written by R. J. Arsenault. Their behaviors are unusual when compared to face-centered cubic (fcc) metals and their alloys that have been extensively dealt with in other reviews. Significant recent findings in the usually treated areas of low-temperature plastic deformation of metals are expertly considered in extensive detail. Arsenault also treats the effects of radiation damage and the superconducting state of bcc materials. Not considered are the topics of twinning, fracture, and grain-size effects. Curiously, an error in the title appears both in the Table of Contents and in the heading of the chapter, namely, "Low Temperature *of* Deformation of bcc Metals . . . ."

In the second chapter, Campbell Laird reviews the cyclic deformation of metals and alloys. He does not attempt a comprehensive treatment in so limited a space, but reviews on a selective basis, drawing from only a few papers in areas of general agreement but citing many more studies where controversies exist, where problems still remain to be solved, or where the phenomena are so complicated that more detailed treatment is appropriate. An attempt is made to illustrate explicitly both the value of cyclic stress-strain response data for fatigue design and the value of microstructural studies in cyclic stress-strain response.

The present understanding of high-temperature creep is reviewed by Amiya K. Mukherjee. He considers the present status of experimental knowledge on the high-temperature diffusion-controlled creep of some metals and alloys with particular reference to the various creep mechanisms. The work is presented in three major sections. The first is concerned with the effects of the independent variables of stress and temperature on the creep rate, and the possible influence of crystal structure, modulus of elasticity, stacking fault energy, and grain size on these data. Second, emphasis is given to a review of the major substructural changes that attend high-temperature creep. Third, a summary is presented on the theoretical implications of the known experimental facts relative to the validity of various proposed high-temperature creep mechanisms. No attempt is made to cover all aspects of creep literature. Instead, attention is directed toward areas where a reasonable understanding has been achieved in uncovering the underlying mechanisms of creep, thereby leading to a satisfactory correlation between the experimental data and theoretical predictions. A number of different diffusion-controlled mechanisms are known to determine high-temperature creep rates, and each is influenced in its own unique way by substructural and microstructural modifications. It is concluded that because of the highly structure-sensitive nature of creep processes, electron microscopy coupled with additional tools of examination will be essential and invaluable aids in unraveling this complex subject.

Review topics in superplasticity are treated by Thomas H. Alden. He doesn't attempt to review the many well-known achievements in this area that have received much attention in the last decade. Instead, a discussion is presented of some subjects previously neglected. Results are presented from several unpublished studies, and an attempt is made to provide a new synthesis of published data that may further clarify the phenomenology and mechanism of superplasticity. Among topics discussed are techniques of grain refinement, grain growth, alloy-specific properties, creep behavior, and the effect of temperature on the strain rate sensitivity. An attempt is made also to evaluate our understanding of these phenomena. Alden's summary makes it clear that although much is known about the superplasticity phenomenon, there are still some mechanisms that remain to be satisfactorily explained.

Broadening the material treatment, P. Beardmore and S. Rabinowitz discuss the current state of understanding of the fatigue deformation of polymers. In a well-presented review it is established that the development of detailed deformation mechanisms in polymers generally is still in its infancy. Most studies so far have been macroscopic and phenomenological in nature. The account of the relatively few sophisticated fatigue studies thus far carried out on polymers indicates that cyclic deformation can contribute to the development of understanding of basic deformation mechanisms and therefore should be conducted concurrently with the more standard types of deformation studies. It is noted that the usefulness of fatigue studies of polymers is greatly enhanced by concurrent examination of both phenomenological and mechanistic properties.

The low-temperature deformation of crystalline nonmetals is reviewed by R. G. Wolfson. The materials