
REVIEWED BY A. J. McEVLlY

Klesnil and Lucas have been actively involved in research on the basic aspects of fatigue for a score of years and are deservedly well recognized for their many contributions to our knowledge of the topic, particularly in areas of dislocation structures, cyclic stress-strain behavior and crack growth analysis, for example. The present book is organized about these areas of fatigue with which they have dealt and the treatments reflect their perspective. Their views have also been influenced by the works of many other researchers as indicated by the 410 references cited from countries in the east as well as the west. The seven chapters cover: cyclic stress-strain response; fatigue crack nucleation; fatigue-crack propagation; fatigue-life curves; notched behavior; and fatigue life under random loading. Topics such as elevated temperature fatigue, corrosion fatigue, and the influence of metallurgical structure on fatigue are not treated to any extent. The text, which has been translated from Czechoslovakian to English by Lucas, is clearly written. The treatment is based on current knowledge of the underlying mechanisms of fatigue crack initiation and growth, and since this knowledge is far from complete, it is not surprising that the authors must resort to semi-empirical approaches to provide quantitative treatment of the subject. The book should be of value to researchers and graduate students concerned with the subject of fatigue.


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This book is comprised of 37 papers presented at the Fatigue Group Conference of the Society of Environmental Engineers held in March 1981 at Warwick University in England. The remarkably rapid publication of these proceedings serves the useful purpose of supplying the information contained in a timely manner to the interested audience. On the other hand, the reader is forewarned that the papers are photo-offset copies of the authors' papers and have therefore not been subject to review. However, in view of the short half-life of the interest in most papers, there is much to be said in favor of rapid publication.

The papers have been grouped into six areas: cyclic deformation and the early stages of fatigue; fundamentals of fatigue crack growth; applying fatigue crack growth models; fatigue of non-metallic materials; life prediction, including environmental effects (a topic not explicitly treated in the chapter); and the interpretation of laboratory and field data. Papers of general interest include "The Evolution of Fatigue Crack Initiation Life Predictions" by Morrow and Socie; "Similitude and Anomalies in Crack Growth Rates" by Broek and Leis; "Fatigue Crack Propagation Characteristics in Engineering and Polymers" by Hertzberg and Manson; "Evaluating the Effect of Residual Stresses on Notched Fatigue Resistance" by Reemsnyder, "Fatigue Data for Design Applications" by Haibach, and "Scatter in Fatigue Life - a Materials, Testing and Design Problem" by Mann. It was the intent of the editors that the papers should be relevant to materials design. Insofar as each of the papers provides more information about an aspect of fatigue, a contribution toward a more rational design procedure has been made by these state-of-the-art papers. The book should be primarily of interest to research workers and designers in the field of fatigue.


REVIEWED BY G. EPSTEIN AND E. G. WOLFF

This book presents a good summary of the patent literature for carbon/graphite (C/G) fibers and composites starting with Thomas Edison's electric lamp using carbonized filaments, through early 1980. A full chapter is devoted to a review of the production and concomitant properties of these fibers, including limited discussion of other advanced fibers/whiskers. Information is also provided on the key fiber manufacturers.

Chapters on matrix materials are organized: (1) resin
matrices for service up to 200°C; (2) for service up to 300°C (emphasizing the polyimides); (3) thermoplastic matrices.

Surface treatments for C/G fibers are essential to processing, handling, and shear properties of composites using these fibers. Again a good review is provided of the published literature.

The remaining chapters provide data on the properties of C/G composites, especially those using epoxy resin matrices. This includes physical, mechanical, and electrical properties, as well as environmental effects.

Final chapters deal with test methods; aerospace, automotive, industrial and commercial applications; manufacturing and processing techniques.

We recommend this book for engineers and designers concerned with advanced composite materials and applications.

Kevlar Composites published Dec. 1980 by Technology Conferences (P.O. Box 842, El Segundo, CA 90245); based on a special symposium in Los Angeles, California; $29.00.

REVIEWED BY G. EPSTEIN AND E. G. WOLFF

This is the first published book devoted to Kevlar composites. A selected group of experts reviews key aspects of Kevlar composites technology: their evolution and applications (aircraft, helicopters, automotive, sporting goods, rocket motors, pressure vessels, tanks); materials properties; design parameters and performance criteria; fabrication technology with a special chapter on machining technology for Kevlar composites.

We find this a highly informative publication, providing valuable insight as well as data in this fast-growing area of composites technology.


REVIEWED BY G. EPSTEIN AND E. G. WOLFF

This book is a compilation of fourteen papers presented during the 1978 ASME Winter Annual Meeting in San Francisco from December 11–15, 1978. The technical sessions were sponsored by the Design Engineering Division of ASME. The editors provide a comprehensive review of the papers in their foreward as well as summarize the motivation for much of the work. Composites are attractive for automobile structural components because of their high specific strength and stiffness, their damage tolerance, corrosion resistance, fatigue response and ease of fabrication. The choice of materials ultimately depends on the volume usage, preferably on the order of ten or a hundred million pounds a year, so that composites will be truly cost competitive with current metallic alloys. The authors represent a fair cross section of automobile manufacturers, material suppliers, university and government. Only four of the papers, however, deal directly with automotive component design and manufacturing. A paper from Ford reviews fabrication methods; another from Ford Aerospace outlines the design methodology for a graphite composite drive shaft and also a transmission support cross member. The author for International Harvester outlines the application of composite design technology to experimental mode shape testing and modelling of a composite auto body. A more futuristic application is outlined by a Lawrence Livermore Lab group—that of composite flywheel rotor development for automotive energy storage. The remainder of the papers are primarily materials oriented, covering such topics as laminate design methodology, viscoelastic effects and properties of discontinuous fiber systems, hybrids, non-woven fabrics, cord rubber laminates and potential graphite, glass, Kevlar and mixed fiber systems. There is little information given on cost effectiveness or fatigue, corrosion or impact response of composites. A more up-to-date review would be able to cover the performance of actual components, e.g., the in-mold coating on the 1980 Chevrolet Corvette hood and fenders, reaction-injection molded glass fiber-reinforced urethane fenders on the Ford Fairmont and Oldsmobile Omega, and the various composite components recently installed on vans and trucks (e.g., leaf springs, hoods, doors). There is considerable interest in such developments by European and Japanese auto makers.

In summary, this book can be profitably read from three points of view: (a) a comprehensive state-of-the-art review of automotive composites in 1978, (b) useful design ideas on topics that are infrequently covered, such as discontinuous fiber composites and (c) a sound introduction to many of the material systems of present and future interest to the automobile industry.