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# Wear and Friction of

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# Elastomers

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Denton/Keshavan, editors



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# *Wear and Friction of Elastomers*

*Robert Denton and M. K. Keshavan, editors*

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# Foreword

This publication, *Wear and Friction of Elastomers*, contains papers presented at the symposium of the same name, held in Philadelphia, PA on 4 Dec. 1991. The symposium was sponsored by ASTM Committee G-2 on Wear and Erosion. Robert Denton and M. K. Keshavan of Smith International, Inc. in Houston, TX, presided as symposium co-chairmen and are the editors of the resulting publication.

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# Overview

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The advances made in the last 20 years in the area of wear and friction of materials is very significant. The number of periodicals, books, and conferences concerned with this subject has grown, and as a result the available information for engineers in this area also is significant. ASTM has played a significant role in developing a number of standard methods and recommended practices in the area of tribology. In the last few years, ASTM Committee G-2, has sponsored a number of symposia and workshops on special subjects covering wear and friction of materials. A number of papers has been published in special publications. The intent was to provide these publications as useful state-of-the-art references of wear testing.

The purpose of the symposium on wear and friction of elastomers was to review and build upon current practices for testing elastomeric materials with regard to wear and friction. The aim was to:

- explore standardization issues that relate to the measurement of elastomeric wear and friction.
- review test methods that are being used by researchers to understand test parameters that affect wear and friction of elastomers.
- increase the understanding of fundamental properties of elastomers and its effect on wear and friction.

This volume significantly increases the available information on the wear and friction of elastomers and provides test methods for measurement of the same. An excellent foundation has been laid for future research in the areas of system dynamics, basic properties of elastomers and its effects, applications of elastomers, and quantitative measurements of wear and friction. This volume is composed of seven papers which examine the various aspects of friction and wear of elastomers.

The article by Floyd W. Wood and James W. Taylor is an overview of standard tests conducted by the Department of Defense (DOD). This specification is intended for product development, first article approval, and routine quality control. A tribometer, designed to stimulate the high contact stresses, reciprocating sliding, and plowing conditions observed for the nonconformal mating wear couple of a total knee prosthesis is described by Robert A. Poggie et al. In his paper, Ronald A. L. Rorrer et al., discusses stick-slip transitions for various elastomeric materials in sliding against hard counterfaces. Michel Barquins' review paper describes in detail the underlying mechanisms of adherence, and of the sliding and rolling friction of rubber-like materials at a microscale level. The paper by Raymond G. Bayer describes a number of different test methods developed by IBM for evaluation of elastomeric materials in various computer peripheral equipment, such as printers, check sorters, and so forth. Finally, Timothy C. Ovaert et al. describes a test method to evaluate friction and wear of rotating elastomeric pump components.

The unifying theme of these papers is a state-of-the-art summary of wear and friction testing of elastomeric materials. One point that was made in virtually every article in this book concerns the complex nature of wear and friction testing of elastomers. In spite of the complexities, the authors clearly indicated that useful and appropriate wear testing can be performed to evaluate materials for various engineering applications.

ASTM Subcommittee G02.30 had previously sponsored a symposium on the "Wear Tests for Plastics: Selection and Use." The reader should refer to *Wear Tests for Plastics: Selection and Use*, STP 701, which contains a group of invited papers. The papers cover wear testing of plastics, modes of wear, and applications.

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