HARDNESS TESTING
PRINCIPLES AND APPLICATIONS

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Preface

Hardness testing is of immense importance for quality assurance in industry. Although the most widely used hardness test methods for metals—Rockwell, Brinell, and Vickers—were developed between 1900 and 1925, in the past ten years they have experienced numerous technical innovations leading to an increase in productivity and the accuracy of hardness tests.

This publication on hardness testing provides, based on the state of standardization, an overview of the hardness testing of metals, plastics, rubber, and other materials. It reports on technical developments such as the introduction of image processing in the Brinell and Vickers methods, the adaptation of hardness testing machines to process-oriented testing conditions, and the development of highly accurate and efficient calibration methods.

Most recently, guidelines have been worked out to determine the uncertainty of hardness measurements as a component of the ISO standards on hardness testing methods. With the aid of these guidelines, it is possible to simply and directly fulfill the requirement of the international standards that say each hardness measurement value must state its uncertainty.

In contrast to the conventional Rockwell, Vickers, and Brinell hardness testing methods, which each produce a single hardness measurement value, the instrumented indentation test features a great amount of information on the elastic and plastic properties of the material. For a wide range of applications, including the nano, micro, and macro levels, the instrumented indentation test offers unique application possibilities. On thin and ultrathin layers with a layer thickness in the nanometer range, it presents a universal method for determining mechanical properties. On the other hand, the instrumented indentation test enables the determination of the indentation depth in the macro range, which is much more efficient than the conventional method of micro-Vickers testing on the cross section of the specimen.

In addition to the hardness testing of metals, the hardness testing of rubber and plastics has an equally great economic importance. As in the case of dynamic hardness testing, an essential feature is that in this area, predo-
minantly portable hardness test devices are used. At the present time, great efforts are being made to increase the accuracy of the rubber and plastics hardness test as well as the dynamic hardness test by means of systematic calibrations of the portable testing devices.

It is necessary to point out that the commercial products mentioned in this publication do not imply any recommendation and are not necessarily the best available products.

I give my special thanks to Mrs. U. Baier-Blott, C. Charvieux, G. Froetel, and E. Jones from the PTB Translation Office for their reliable and accurate translation of the German manuscript of this book into English.

This book, the articles of which have been written by a group of renowned experts in the field of hardness testing, addresses, above all, experts in materials testing and quality control, students of materials science, as well as technologists and design engineers in the metals and plastics processing industries.

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