

Series Preface

Mechanical engineering, an engineering discipline forged and shaped by the needs of the industrial revolution, is once again asked to do its substantial share in the call for industrial renewal. The general call is urgent as we face profound issues of productivity and competitiveness that require engineering solutions. The Mechanical Engineering Series features graduate texts and research mono-graphs intended to address the need for information in contemporary areas of mechanical engineering.

The series is conceived as a comprehensive one that covers a broad range of concentrations important to mechanical engineering graduate education and re-search. We are fortunate to have a distinguished roster of consulting editors on the advisory board, each an expert in one of the areas of concentration. The names of the consulting editors are listed on the facing page of this volume. The areas of concentration are applied mechanics, biomechanics, computational me-chanics, dynamic systems and control, energetics, mechanics of materials, processing, production systems, thermal science, and tribology.

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Frederick F. Ling

Preface

There has been considerable interest in the last two decades in the mechanical characterisation of thin film systems and small volumes of material using depth-sensing indentation tests utilising either spherical or pyramidal indenters. Usually, the principal goal of such testing is to obtain values for elastic modulus and hardness of the specimen material from experimental readings of indenter load and depth of penetration. The forces involved are usually in the millinewton range and are measured with a resolution of a few nanonewtons. The depths of penetration are in the order of nanometres, hence the term “nanoindentation.”

This third edition of Nanoindentation adds the results of new research in this field, and includes more information about nanoindentation instrumentation and applications. The book is intended for those who are entering the field for the first time and to act as a reference for those already conversant with the technique.

In preparing this book, I was encouraged and assisted by many friends and colleagues. Particular thanks to Ben Beake, Trevor Bell, Avi Bendavid, Alec Bendeli, Robert Bolster, Andy Bushby, Yanping Cao, Yang-Tse Cheng, Christophe Comte, Peter Cusack, John Field, Asa Jamting, Nigel Jennett, Brian Lawn, Boon Lim, Alfonso Ngan, Darien Northcote, Paul Rusconi, Sergio Santos, Doug Smith, Jim Smith, Eric Thwaite, Stan Veprek, Yvonne Wilson, David Vodnick, Oden Warren, and Thomas Wyrobek for their advice and assistance. I thank Hysitron Inc. and Micro Materials Ltd for their important contributions. I gratefully acknowledge the support of the CSIRO Division of Telecommunications and Industrial Physics and, in particular, Ken Hews-Taylor who supported the UMIS instrument for many years in his management portfolio, the staff of the library, and the Chief of the Division for his permission to use the many figures that appear in this book. I also thank the many authors and colleagues who publish in this field from whose work I have drawn and without which this book would not be possible. Finally, I thank the editorial and production team at Springer-Verlag New York, Inc., for their very professional and helpful approach to the whole publication process.

Sydney, Australia

Anthony C. Fischer-Cripps

Nanoindentation

Fischer-Cripps, A.C.

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