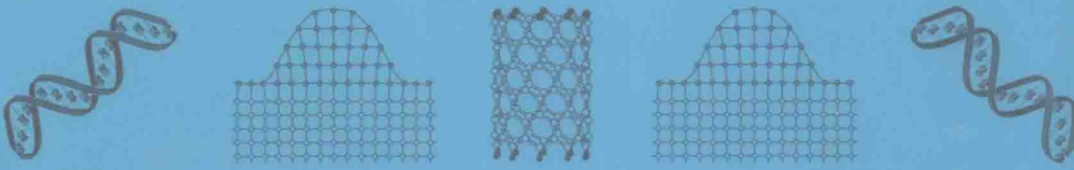

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Nanostructured Coatings

Edited by
Albano Cavaleiro and Jeff Th. M. De Hosson

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Cover Illustration: Cross-sectional transmission electron micrograph of a nc-Ti/a- C:H nanocomposite coating after nanoindentation (Yutao Pei, Damiano Galvan, Jeff Th. M. De Hosson, University of Groningen, The Netherlands)

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Foreword

Controlling the performance of structures and components of all sizes and shapes through the use of engineered coatings has long been a key strategy in materials processing and technological design. The ever-increasing sophistication of engineered coatings and the rapid trend toward producing increasingly smaller devices with greater demands on their fabrication, properties and performance have led to significant progress in the science and technology of coatings, particularly in the last decade or two. Nanostructured coatings constitute a major area of scientific exploration and technological pursuit in this development. With characteristic structural length scales on the order of a few nanometers to tens of nanometers, nanostructured coatings provide potential opportunities to enhance dramatically performance by offering, in many situations, extraordinary strength and hardness, unprecedented resistance to damage from tribological contact, and improvements in a number of functional properties. At the same time, there are critical issues and challenges in optimizing these properties with flaw tolerance, interfacial adhesion and other nonmechanical considerations, depending on the coating systems and applications.

Nanostructured coatings demand study in a highly interdisciplinary research arena which encompasses:

- surface and interface science
- study of defects
- modern characterization methodologies
- cutting-edge experimental developments to deposit,synthesize, consolidate, observe as well as chemically and mechanically probe materials at the atomic and molecular length scales
- state-of-the-art computational simulation techniques for developing insights into material behaviour at the atomic scale which cannot be obtained in some cases from experiments alone

The interdisclipinary nature of the subject has made it a rich playing field for scientific innovation and technological progress.

Albano Cavaleiro and Jeff De Hosson have edited an outstanding volume on nanostructured coatings which provides an excellent snapshot of the state-of-the-art in this important topic. They have assembled as contributors to this volume an impressive group of research teams who have participated in the rapid progress this area has seen in the recent past. The volume provides a very balanced picture of the broad scope of the field, while at the same time capturing the rich details associated with the various topics covered. The community will benefit greatly from the hard work of the editors and authors of this volume, and I expect this volume to have a significant impact on research and practice involving nanostructured coatings.

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