

Preface to the Second Edition

Surface and interface physics has in recent decades become an ever more important subdiscipline within the physics of condensed matter. Many phenomena and experimental techniques, for example the quantum Hall effect and photoemission spectroscopy for investigating electronic band structures, which clearly belong to the general field of solid-state physics, cannot be treated without a profound knowledge of surface and interface effects. This is also true in view of the present general development in solid-state research, where the quantum physics of nanostructures is becoming increasingly relevant. This also holds for more applied fields such as microelectronics, catalysis and corrosion research. The more one strives to obtain an atomic-scale understanding, and the greater the interest in microstructures, the more surface and interface physics becomes an essential prerequisite.

In spite of this situation, there are only a very few books on the market which treat the subject in a comprehensive way, even though surface and interface physics has now been taught for a number of years at many universities around the world. In my own teaching and research activities I always have the same experience: when new students start their diploma or PhD work in my group I can recommend to them a number of good review articles or advanced monographs, but a real introductory and comprehensive textbook to usher them into this fascinating field of modern research has been lacking.

I therefore wrote this book for my students to provide them with a text from which they can learn the basic models, together with fundamental experimental techniques and the relationship to applied fields such as microanalysis, catalysis and microelectronics.

This textbook on the physics of surfaces and interfaces covers both experimental and theoretical aspects of the subject. Particular attention is paid to practical considerations in a series of self-contained panels which describe UHV technology, electron optics, surface spectroscopy and electrical and optical interface characterisation techniques. The main text provides a clear and comprehensive description of surface and interface preparation methods, structural, vibrational and electronic properties, and adsorption and layer growth. Because of their essential role in modern microelectronics, special emphasis is placed on the electronic properties of semiconduc-

tor interfaces and heterostructures. Emphasizing semiconductor microelectronics as one of the major applications of interface physics is furthermore justified by the fact that here the gap between application and basic research is small, in contrast, for example, with catalysis or corrosion and surface-protection research.

The book is based on lectures given at the Rheinisch-Westfälische Technische Hochschule (RWTH) Aachen and on student seminars organized with my colleagues Pieter Balk, Hans Bonzel, Harald Ibach, Jürgen Kirchner, Claus-Dieter Kohl and Bruno Lengeler. I am grateful to these colleagues and to a number of students participating in these seminars for their contributions and for the nice atmosphere during these courses. Other valuable suggestions were made by some of my former doctoral students, in particular by Arno Förster, Monika Mattern-Klosson, Richard Matz, Bernd Schäfer, Thomas Schäpers, Andreas Spitzer and Andreas Tulke. For her critical reading of the manuscript, as well as for many valuable contributions, I want to thank Angela Rizzi.

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Aachen and Jülich
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Hans Lüth



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Lüth, H.

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