

Preface to the second edition

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The first edition of Volume D appeared in 2003. This second edition includes a new chapter and eight chapters have been updated, three of them extensively, with entirely new sections included.

Volume D deals with the influence of symmetry on the physical and tensor properties of crystals and on their structural phase transitions. It is an up-to-date account of the physical properties of crystals, with many useful tables, aimed at a wide readership in the fields of mineralogy, crystallography, solid-state physics and materials science; it brings together various topics that are usually to be found in quite different handbooks but that have in common their tensor nature and the role of crystallographic symmetry. The overall structure of the volume has remained unchanged.

Part 1 introduces the mathematical properties of tensors and group representations, and gives their independent components for each of the crystallographic groups. Several examples of tensor properties are described: elastic properties, thermal expansion, magnetic properties, linear and nonlinear optical properties, transport properties, atomic displacement parameters, and local electric susceptibility. A new section presenting multiferroics, a field which has seen big progress in recent years, has been added to Chapter 1.5 on magnetic properties. A new

chapter (Chapter 1.11) deals with the tensor properties of local crystal properties. It considers the impact of symmetry on local physical properties. The symmetry and physical phenomena that allow and restrict forbidden reflections excited at radiation energies close to X-ray absorption edges of atoms are described; reflections caused by magnetic scattering are also discussed.

Part 2 is devoted to the symmetry aspects of excitations in reciprocal space: phonons, electrons, Raman scattering and Brillouin scattering.

Part 3 deals with the symmetry aspects of structural phase transitions and twinning. Chapter 3.3, *Twinning of crystals*, has been considerably updated with a large new section on the effect of twinning in reciprocal space, and a section on the relations between twinning and domain structure, the topic of Chapter 3.4, which has also been entirely updated, with new tables and new figures.

It is a pleasure to thank all the authors who have updated their contributions and the authors of the new chapter. I am particularly grateful to the Technical Editor, Nicola Ashcroft, who incorporated all the corrections, sometimes quite complicated, to the existing chapters, and who edited the new chapter and the new sections with speed, highly professional efficiency and good humour.