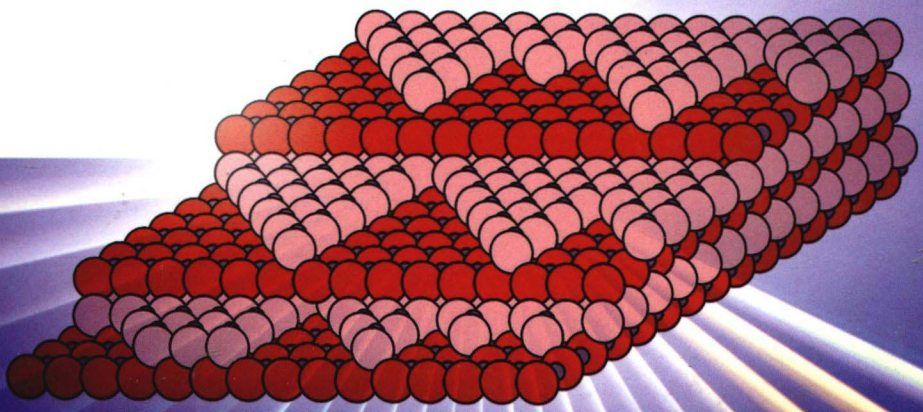
Inorganic Materials Series



Multi Length-Scale Characterisation

Editors
Duncan W. Bruce | Dermot O'Hare | Richard I. Walton

WILEY

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Series Titles

Functional Oxides
Molecular Materials
Porous Materials
Low-Dimensional Solids
Energy Materials
Local Structural Characterisation
Multi Length-Scale Characterisation

Forthcoming Title

Structure from Diffraction Methods

Inorganic Materials Series Preface

Back in 1992, two of us (DWB and DO'H) edited the first edition of *Inorganic Materials* in response to the growing emphasis and interest in materials chemistry. The second edition, which contained updated chapters, appeared in 1996 and was reprinted in paperback. The aim had always been to provide the reader with chapters that while not necessarily comprehensive, nonetheless gave a first-rate and well-referenced introduction to the subject for the first-time reader. As such, the target audience was from first-year postgraduate student upwards. Authors were carefully selected who were experts in their field and actively researching their topic, so were able to provide an up-to-date review of key aspects of a particular subject, whilst providing some historical perspective. In these two editions, we believe our authors achieved this admirably.

In the intervening years, materials chemistry has grown hugely and now finds itself central to many of the major challenges that face global society. We felt, therefore, that there was a need for more extensive coverage of the area and so Richard Walton joined the team and, with Wiley, we set about a new and larger project. *The Inorganic Materials Series* is the result and our aim is to provide chapters with a similar pedagogical flavour but now with much wider subject coverage. As such, the work will be contained in several themed volumes. Many of the early volumes concentrate on materials derived from continuous inorganic solids, but later volumes will also emphasise molecular and soft matter systems as we aim for a much more comprehensive coverage of the area than was possible with *Inorganic Materials*.

We approached a completely new set of authors for the new project with the same philosophy in choosing actively researching experts, but also with the aim of providing an international perspective, so to reflect the diversity and interdisciplinarity of the now very broad area of inorganic materials chemistry. We are delighted with the calibre of authors who have agreed to write for us and we thank them all for their efforts

and cooperation. We believe they have done a splendid job and that their work will make these volumes a valuable reference and teaching resource.

DWB, York
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October 2013

Preface

Inorganic materials show a diverse range of important properties that are desirable for many contemporary, real-world applications. Good examples include recyclable battery cathode materials for energy storage and transport, porous solids for capture and storage of gases, and molecular complexes used in electronic devices. Some of these families of materials, and many others, were reviewed in earlier volumes of the *Inorganic Materials Series*. When considering property-driven research in this large field, it is immediately apparent that methods for structural characterisation must be applied routinely in order to understand the functions of materials and thus optimise their behaviour for real applications. Thus 'structure–property relationships' are an important part of research in this area. To determine structure effectively, advances in methodology are important: the aim is often rapidly to examine increasingly complex materials in order to gain knowledge of structure over length scales ranging from local atomic order, through crystalline, long-range order to the meso- and macro-scopic.

No single technique can examine these levels of order simultaneously, and the chapters presented in this volume deal with recent advances in important methods that allow structural investigation of various classes of inorganic materials over a variety of length scales. This volume therefore examines some key methods required to characterise contemporary inorganic materials and to understand their use in practical applications. The five detailed chapters presented here cover Magnetic Properties, Thermal Methods, Atomic Force Microscopy, Gas Sorption and Dynamic Light Scattering.

The techniques discussed in this volume are diverse in nature, but in each case an excellent background and introduction is given, along with examples that illustrate the scope of the method, how it is applied and the information that it can be used to gain. Thus, three of the approaches (Magnetic Properties, Thermal Methods and Gas Sorption) deal with the bulk properties of materials, while AFM looks at structure on atomic length scales and Light Scattering deals with particle sizing. In particular, Light Scattering includes an introduction to, and discussion of, the new method of differential dynamic microscopy.

As ever, we approached a team of expert authors to contribute to this volume and we are delighted with the job they have done; we take this opportunity to thank them publicly. Taken together with *Local Structural Characterisation* and *Structure from Diffraction Methods*, the chapters in this volume describe a wide range of methods for the characterisation of inorganic materials, which we hope will find value as a reference source for those engaged in their study.

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