

Preface

Neutron scattering has grown from being a physics and chemistry centred technique in which lattice dynamics and crystallography were the mainstays, to a more interdisciplinary field which includes areas as diverse as engineering, archaeology, food, plastics and all manner of nanostructured materials. The study of sustainable-energy materials is highly cross-disciplinary in nature, with the diverse activities frequently having some background in neutron-scattering techniques, which reflects the innate applicability of neutron scattering in this area. It is not surprising to find that many neutron-scattering centres are supporting an “energy project” of some description that brings together the in-house and user activities. It is refreshing to see scientists with widely-varying expertise making a joint approach to understanding and improving energy materials. Progress is made through a number of avenues:

1. Increasing performance of neutron sources and their associated instrumentation.
2. Improvement of specialised instrumentation, sample environments, and ancillary equipment (such as in situ cells), aided by collaboration, workshops, and conferences.
3. Computational resources and algorithms adapted to modelling structure and dynamics in increasingly complex materials are being both validated and used in the study of sustainable energy with neutrons.
4. Studentships and fellowships in the field are increasing, bringing fresh ideas and new approaches to the way neutron scattering is used and the data analysed.
5. Increasing awareness of the importance of sustainable energy in society, and the role that neutron techniques of analysis plays, helping to increase the resources that are allocated to this area.

This book brings together some of the core aspects of sustainable-energy materials that can be studied with neutrons, but there are obviously many other important neutron-based studies in the area that fall outside this core, for example in the fields of wind, hydro, and biomass. Similarly, a large number of non-neutron techniques are used to study the materials that we discuss in this book, and it is

frequently the combination of information from a number of techniques that leads to the final understanding.

Although the book does not contain dedicated theory or instrumental sections, the volume is aimed at those who have little or no knowledge of neutron-based techniques of analysis, and instead we refer to an earlier volume in this series in which these topics are presented in detail. The contents of this book are aimed at professionals at all levels in the field of sustainable energy, to show the types of question that can be addressed using neutrons. Some chapters in the book take the form of a review, whilst others use case studies to provide a more targeted approach. The book is structured chronologically, beginning with energy generation, moving onto storage, and then to use, although each chapter can be read independently of the others. The loose theme of application of sustainability-materials in transport applications that runs through many of the chapters is rather artificial, because each chapter has at least some bearing on stationary applications.

We are sincerely grateful to all the authors for their willingness to find the time to provide their chapters. They are all active in research and can only make their contribution to this book by taking time away from their research projects. We do understand.

Lucas Heights, NSW, Australia, October 2014

Gordon J. Kearley
Vanessa K. Peterson

Neutron Applications in Materials for Energy

Kearley, G.J.; Peterson, V.K. (Eds.)

2015, X, 306 p. 166 illus., 81 illus. in color., Hardcover

ISBN: 978-3-319-06655-4