Book review

There are not many books dedicated to materials properties of a specific crystal structure type. “Properties of Fluorite Structure Materials” (195 pages), edited by Peter Vajda and Jean-Marc Costantini, is one of them.

Interestingly, the Editors chose to treat only two classes of fluorite type compounds, i.e. hydrides (rare-earth, actinides) and oxides (lithium, zirconium, cerium, actinides), and both have very different properties (mainly metallic and magnetic for the hydrides, non-metallic and mainly non-magnetic for the oxides). While this approach precludes comprehensiveness, it has the advantage of conveying to the reader a well-focused view on recent advances in two important subfields of the energy sector, i.e. hydrogen technology on the one hand, and solid oxide fuel cells and nuclear reactors on the other.

Specifically, the book focuses on first-principles calculations for rare earth hydrides and the influence of compositional changes on their electronic and magnetic properties, including high-pressure effects, and on the influence of irradiation on properties, such as the creation of point defects (lithium oxide), lattice damage (zirconia, ceria) and radiation damage built-up in nuclear fuels (actinide oxides). As the reader will discover by himself, a common feature of the materials treated in the book is the big influence of small deviations from CaF2 stoichiometry and crystal structure on their properties.

The book is grouped into six chapters, which are treated by world-leading experts in the fields. Their texts are clearly written, and the illustrations figures, diagrams, charts and tables are abundant, although the quality of the figures reproduced in some chapters leaves to be desired.

A particularly welcome addition at the end of the book is the subject Index, which goes to the merit of the Publisher. Although some subjects treated in the text do not appear in this Index, such as the element names Praseodymium, Samarium, Erbium, Gadolinium, Terbium, Dysprosium, Thulium, its overall usefulness is obvious.

This book (edition 2013) is an invaluable resource for materials scientists and solid-state physicists and chemists with an interest in hydrides and oxides in the energy sector, as well as for advanced students and

graduates who wish to familiarize themselves with these important classes of compounds. As to the latter audience, one might regret the book's relatively high price, given that free access is granted only to one of the chapters.

Notwithstanding this, you cannot go wrong with this book. From the physics and chemistry graduate to the experienced material scientist, this is a great reference. Anyone not already a material's buff in the energy sector will learn a lot.

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