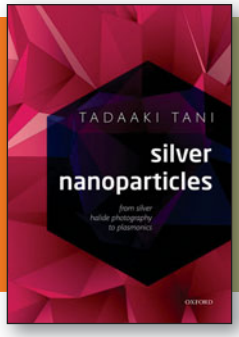


Silver Nanoparticles: From Silver Halide Photography to Plasmonics

Tadaaki Tani

Oxford University Press, 2015
240 pages, $110.00
ISBN 978-0-19-871460-6

This book gives an overview of silver (Ag) and silver halide (AgX, X = Br, I) nanoparticles used in the field of photography and other applications. Topics include structure, synthesis, photophysics, catalysis, photovoltaics, and stability.

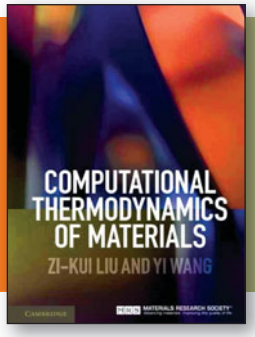
Chapter 1 introduces metal nanoparticles, plasmonics, and AgX photography. Chapter 2 reviews the shape and structure of metal, Ag, and AgX nanoparticles. The structures of nuclei and seeds, single-crystalline nanoparticles, nanoparticles modified by crystal defects, and composite structures are described. The chapter then gives methods for characterizing the crystal structures. Chapter 3 reviews the preparation of Ag nanoparticles and related materials for plasmonics and AgX photography. The chemistry of nanoparticle synthesis is given, including nuclei and seeds, preparation of single-crystalline nanoparticles, and growth of asymmetric nanoparticles through the introduction of defects and surfactants. The preparation of AgX nanoparticles for photography focuses on AgX-gelatin interactions and a discussion of various methods for preparation of single-crystalline and tabular AgX nanoparticles. There is a description of industrial-scale AgX nanoparticle synthesis. Methods for the arrangement of AgX and Ag nanoparticles needed for fine imaging and fabrication of photographic film are described.

Chapter 4 covers light absorption and scattering of Ag, including molecule-scale Ag nanoparticles as well as larger isotropic and anisotropic Au nanoparticles, nanorods, and nanoplates. There is a discussion of light absorption of J- and H-aggregated chromophores, Ag nanoparticles, and related materials in AgX photography. Chapter 5 discusses catalysis by Ag and other metal nanoparticles in plasmonics and photography. Topics discussed include photocatalytic water splitting and hydrogen production. There follows a discussion of the role of Ag catalysts in the mechanism of photographic development.

Chapter 6 focuses on the photovoltaic effect in Ag and other metal nanoparticles, covering light-induced charge separation in inorganic and organic semiconductors. The chapter also covers light-induced charge separation in Ag/AgX nanoparticle systems in relation to photography. Chapter 7 covers stability of Ag and other metal nanoparticles in AgX photography. There is an extensive discussion of the effect of gelatin on the electrochemical properties of Ag nanoparticles and the reasons why it performs better than other polymers. The chapter also discusses the electronic structure of Ag nanoparticles in gelatin layers in ambient atmosphere and stabilization of Ag and other metal nanoparticles in photographic materials and plasmonic devices.

Historically, Ag and AgX nanoparticles have played central roles in photography. Due to the rise of digital photography, knowledge of AgX photography risks being lost. This book is important because it gives an overview of this field drawn from the history of photography and how it can be applied to emerging technologies such as catalysis, photovoltaics, and plasmonics. The author has worked in the photography industry for nearly 50 years and has a deep knowledge that is reflected in this book. There are 566 references, including critical articles from the early history of AgX photography, and 168 figures. This book is a useful reference for researchers and graduate students interested in all aspects of plasmonics and metal nanoparticles.

***Reviewer: Thomas M. Cooper** of the Air Force Research Laboratory, USA.*



Computational Thermodynamics of Materials

Zi-Kui Liu and Yi Wang

Materials Research Society and
Cambridge University Press, 2016
260 pages, $89.99 (e-book $72.00)
ISBN 9780521198967

In the interest of transparency, MRS is a co-publisher of this title. However, this review was requested and reviewed by an independent Book Review Board.

This authoritative volume introduces the reader to computational thermodynamics and the use of this approach to the design of material properties by tailoring the chemical composition. The text covers applications of this approach, introduces the relevant computational codes, and offers exercises at the end of each chapter.

The book has nine chapters and two appendices that provide background material on computer codes. Chapter 1 covers the first and second laws of thermodynamics, introduces the spinodal limit of stability, and presents the Gibbs–Duhem equation. Chapter 2 focuses on the Gibbs energy function. Starting with a homogeneous system with a single phase, the authors proceed to phases with variable compositions and polymer blends. The discussion includes the contributions of