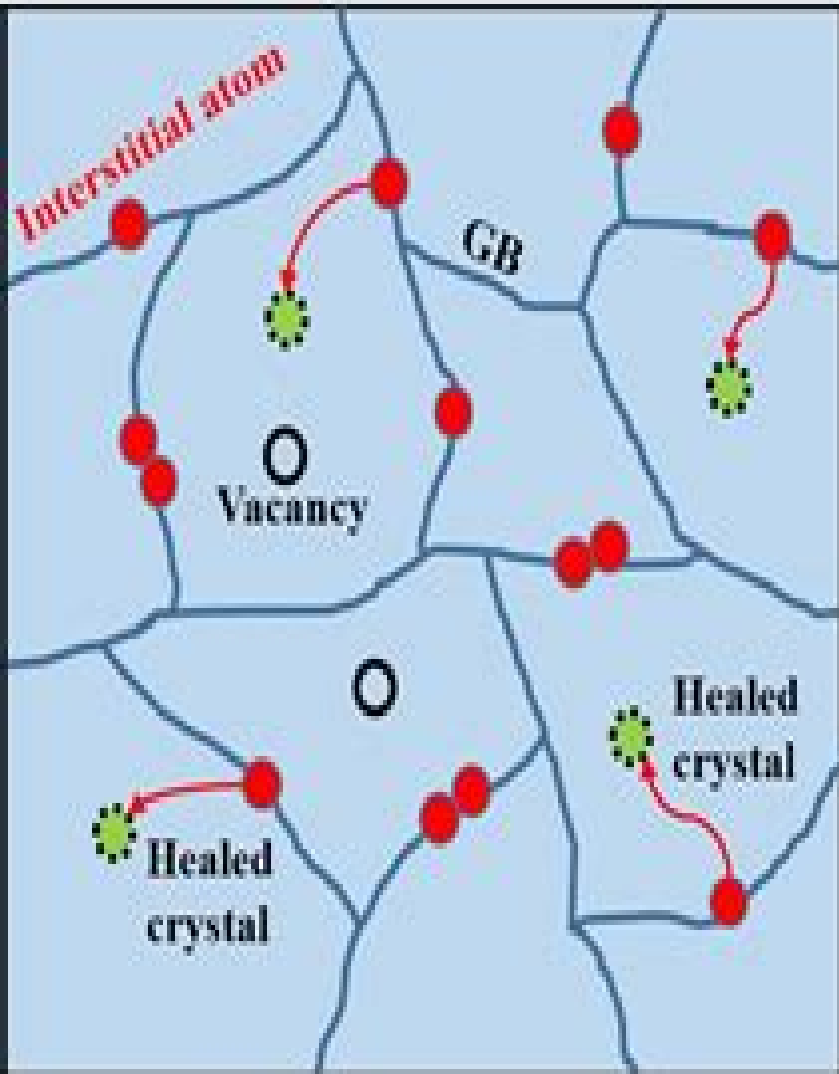
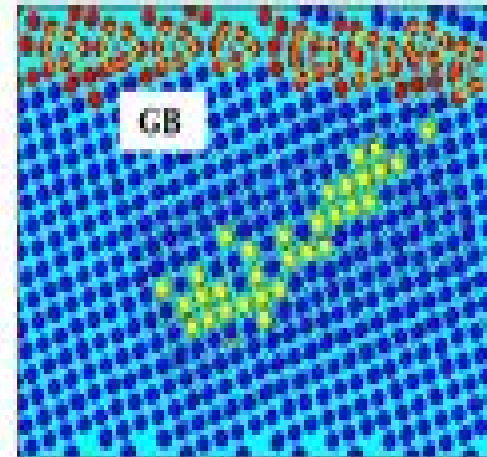
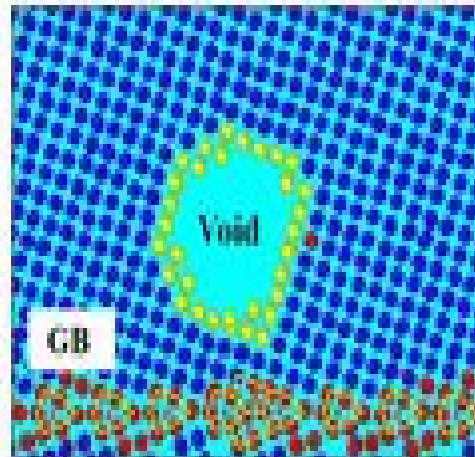
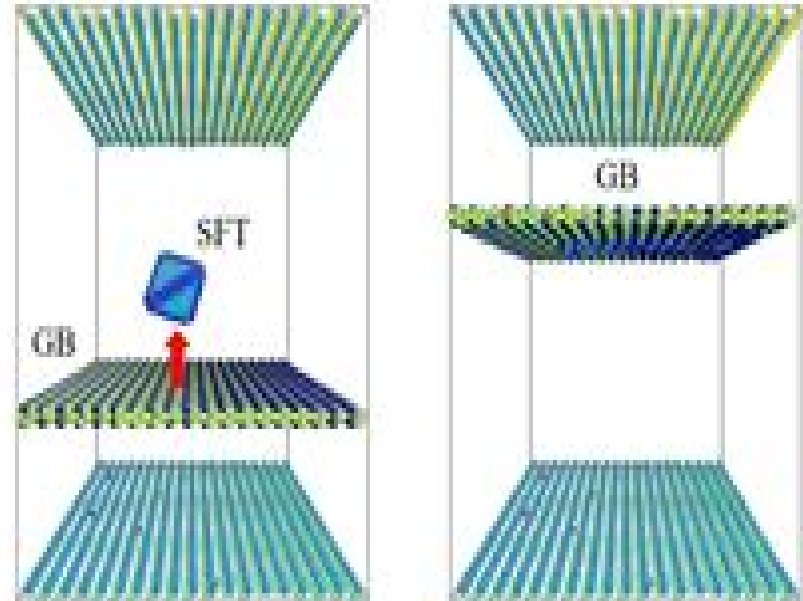


# Nanocrystalline Metal



Interstitial atom – vacancy recombination mechanism



Grain boundary migration mechanism

# Nanocrystalline Materials

**Sie-Chin Tjong**



## **Nanocrystalline Materials:**

**Nanocrystalline Materials** Sie-Chin Tjong, 2006-06-23 Nanocrystalline materials with new functionalities show great promise for use in industrial applications such as reinforcing fillers in novel polymer composites and substantial progress has been made in the past decade in their synthesis and processing However there are several issues that need to be addressed to develop these materials further Among these exploration of novel methods for the large scale synthesis of low cost self assembled nanostructures is a challenging research topic Accordingly there has emerged a demand to study their synthesis structure property relationships in order to understand the fundamental concepts underlying the observed physical and mechanical properties With contributions from leading experts this book describes the fundamental theories and concepts that illustrate the complexity of the problem in developing novel nanocrystalline materials It reviews the most up to date progress in the synthesis microstructural characterization physical and mechanical behavior and application of nanomaterials Investigates the synthesis characterisation and properties of a huge variety of nanocrystalline materials and their applications in industry Keeps the prominent challenges in nanomaterials fabrication at the forefront while offering the most up to date scientific findings Nanocrystalline Materials Aleksandr Ivanovich Gusev, Andrei Andreevich Rempel', 2004 In the monograph the first of this type in the world the authors discuss systematically the current state of investigations into nanocrystalline materials The experimental results on the effect of the nanocrystalline state on the microstructure and the mechanical thermophysical optical and magnetic properties of metals alloys and solid phase compounds are generalised Special attention is given to the main methods of production of isolated nanoparticles ultrafine powders and dense nanocrystalline materials The dimensional effects in isolated nanoparticles and high density nanocrystalline materials are discussed in detail and the important role of the interface in the formation of the structure and properties of dense nanocrystalline materials is shown The modelling considerations explaining special features of the structure and anomalous properties of substances in the nanocrystalline condition are analysed **Structural Nanocrystalline Materials** Carl C. Koch, Ilya A. Ovid'ko, Sudipta Seal, Stan Veprek, 2007-05-31 Nanocrystalline materials exhibit exceptional mechanical properties representing an exciting new class of structural materials for technological applications The advancement of this important field depends on the development of new fabrication methods and an appreciation of the underlying nano scale and interface effects This authored book addresses these essential issues presenting for the first time a fundamental coherent and current account at the theoretical and practical level of nanocrystalline and nanocomposite bulk materials and coatings The subject is approached systematically covering processing methods key structural and mechanical properties and a wealth of applications This is a valuable resource for graduate students studying nanomaterials science and nanotechnologies as well as researchers and practitioners in materials science and engineering **Amorphous and Nanocrystalline Materials** A. Inoue, K. Hashimoto, 2013-04-17 Amorphous and nanocrystalline materials are a class of their

own Their properties are quite different to those of the corresponding crystalline materials This book gives systematic insight into their physical properties structure behaviour and design for special advanced applications The book will appeal to researchers research engineers and advanced students in materials science *Handbook of Nanophase and Nanostructured Materials: Synthesis* Zhong Lin Wang, Yi Liu, Ze Zhang, 2003 Microstructure And Properties Of Materials, Vol 2 James C M Li, 2000-10-09 This is the second volume of an advanced textbook on microstructure and properties of materials The first volume is on aluminum alloys nickel based superalloys metal matrix composites polymer matrix composites ceramics matrix composites inorganic glasses superconducting materials and magnetic materials It covers titanium alloys titanium aluminides iron aluminides iron and steels iron based bulk amorphous alloys and nanocrystalline materials There are many elementary materials science textbooks but one can find very few advanced texts suitable for graduate school courses The contributors to this volume are experts in the subject and hence together with the first volume it is a good text for graduate microstructure courses It is a rich source of design ideas and applications and will provide a good understanding of how microstructure affects the properties of materials Chapter 1 on titanium alloys covers production thermomechanical processing microstructure mechanical properties and applications Chapter 2 on titanium aluminides discusses phase stability bulk and defect properties deformation mechanisms of single phase materials and polysynthetically twinned crystals and interfacial structures and energies between phases of different compositions Chapter 3 on iron aluminides reviews the physical and mechanical metallurgy of Fe<sub>3</sub>Al and FeAl the two important structural intermetallics Chapter 4 on iron and steels presents methodology microstructure at various levels strength ductility and strengthening toughness and toughening environmental cracking and design against fracture for many different kinds of steels Chapter 5 on bulk amorphous alloys covers the critical cooling rate and the effect of composition on glass formation and the accompanying mechanical and magnetic properties of the glasses Chapter 6 on nanocrystalline materials describes the preparation from vapor liquid and solid states microstructure including grain boundaries and their junctions stability with respect to grain growth particulate consolidation while maintaining the nanoscale microstructure physical chemical mechanical electric magnetic and optical properties and applications in cutting tools superplasticity coatings transformers magnetic recordings catalysis and hydrogen storage **Handbook of Modern Ferromagnetic Materials** Alex Goldman, 1999-05-31 The Handbook of Modern Ferromagnetic Materials is an up to the minute compendium of all ferromagnetic materials metallic and ceramic intended for electrical and electronic applications Coverage of the newest and most economically important materials soft ferrites the rare earth magnet alloys amorphous and nanocrystalline alloys is extensive The distinctive feature of this book is its correlation of basic material properties metallurgical and ceramic with their magnetic characteristics and eventually to the choice in an application Unique to this work is information on the many magnetic components into which these materials can be formed and the pertinent design data Another useful feature is the criteria quality stability and economic for selection of a particular

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