

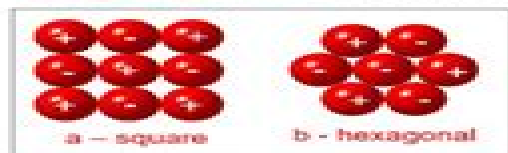
Structure of Inorganic Solids

Inorganic solids can be built of discrete molecules; however, most consist of infinite arrays of atoms or ions. Half of the elements are metals in which close-packed atoms are held together by delocalised electrons. The noble gases form solids in which close-packed atoms are held together by dispersion forces. Other elements consist of infinite networks of more localised bonds. Ionic solids form infinite networks held together by coulombic forces between ions of opposite charge – these structures are the basis of crystallinity.

Close packing in solids



Close packing of spheres in 1 dimension



Close packing in 2 dimensions

(a, co-ordination number = 4)
(b, co-ordination number = 6)

The best close packed arrangement is b – all spheres are in contact and 6 surround the central sphere. However, for ions, a is preferred in an open structure, where 9 spheres surround the central sphere, only 4 are in contact. B has the same charges in contact, which provides a high repulsive energy, where a has a much lower coulombic energy.

In 3D, there are two ways in which the above and below layers can pack. In both, the central sphere will be surrounded by 3 above and 3 below, making a co-ordination of 12.

Hexagonal close packing

A
B
A
B

Pattern repeats after every other row

1st layer
2nd layer
3rd layer
4th layer

Cubic close packing

A
B
C
A

Pattern repeats after every three rows



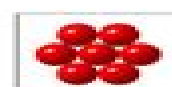
Hexagonal close packing

A
B
A
B

Pattern repeats after every other row



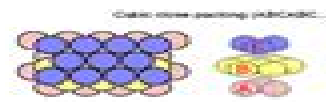
In hcp the spheres fill 74% of the available space – 26% present as holes in the structure
(examples include Be, Mg, Zn, Cd)



Cubic close packing

A
B
C
A

Pattern repeats after every three rows



In ccp the spheres fill 74% of the available space – 26% present as holes in the structure
(examples include Al, Ni, Cu, Ag, Pt, Au)

Structure And Properties Of Inorganic Solids

Anthony R. West



Structure And Properties Of Inorganic Solids:

Structure and Properties of Inorganic Solids Francis S. Galasso, 1970 **Structure and Properties of Inorganic Solids** Francis S. Galasso, 1970 **Structure and properties of inorganic solids by Francis Salvatore Galasso** , 1970

Structure and Chemistry of Crystalline Solids Bodie Douglas, Shi-Ming Ho, 2007-03-20 Understandable by anyone concerned with crystals or solid state properties dependent on structure Presents a general system using simple notation to reveal similarities and differences among crystal structures More than 300 selected and prepared figures illustrate structures found in thousands of compounds *Solid State Chemistry and its Applications* Anthony R. West, 2022-04-06

SOLID STATE CHEMISTRY AND ITS APPLICATIONS A comprehensive treatment of solid state chemistry complete with supplementary material and full colour illustrations from a leading expert in the field *Solid State Chemistry and its Applications* Second Edition delivers an advanced version of West's classic text in solid state chemistry expanding on the undergraduate Student Edition to present a comprehensive treatment of solid state chemistry suitable for advanced students and researchers The book provides the reader with an up to date account of essential topics in solid state chemistry and recent developments in this rapidly developing field of inorganic chemistry Significant updates and new content in this second edition include A more extensive overview of important families of inorganic solids including spinels perovskites pyrochlores garnets Ruddlesden Popper phases and many more New methods to synthesise inorganic solids including sol gel methods combustion synthesis atomic layer deposition spray pyrolysis and microwave techniques Advances in electron microscopy X ray and electron spectroscopies New developments in electrical properties of materials including high T_c superconductivity lithium batteries solid oxide fuel cells and smart windows Recent developments in optical properties including fibre optics solar cells and transparent conducting oxides Advances in magnetic properties including magnetoresistance and multiferroic materials Homogeneous and heterogeneous ceramics characterization using impedance spectroscopy Thermoelectric materials MXenes low dimensional structures memristors and many other functional materials Expanded coverage of glass including metallic and fluoride glasses cement and concrete geopolymers refractories and structural ceramics Overview of binary oxides of all the elements their structures properties and applications Featuring full color illustrations throughout readers will also benefit from online supplementary materials including access to CrystalMaker software and over 100 interactive crystal structure models Perfect for advanced students seeking a detailed treatment of solid state chemistry this new edition of *Solid State Chemistry and its Applications* will also earn a place as a desk reference in the libraries of experienced researchers in chemistry crystallography physics and materials science NBS Technical Note , 1963 Complex Inorganic Solids Patrice E. A. Turchi, Antonios Gonis, Krishna Rajan, Annemarie Meike, 2007-12-31

One of the key aspects of this volume is to cut across the traditional taxonomy of disciplines in the study of alloys Hence there has been a deliberate attempt to integrate the different approaches taken towards alloys as a class of materials in

different fields ranging from geology to metallurgical engineering The emphasis of this book is to highlight commonalities between different fields with respect to how alloys are studied The topics in this book fall into several themes which suggest a number of different classification schemes We have chosen a scheme that classifies the papers in the volume into the categories Microstructural Considerations Ordering Kinetics and Diffusion Magnetic Considerations and Elastic Considerations The book has juxtaposed apparently disparate approaches to similar physical processes in the hope of revealing a more dynamic character of the processes under consideration This monograph will invigorate new kinds of discussion and reveal challenges and new avenues to the description and prediction of properties of materials in the solid state and the conditions that produce them

Handbook of Solid State Chemistry, 6 Volume Set Richard Dronskowski, Shinichi Kikkawa, Andreas Stein, 2017-10-23 This most comprehensive and unrivaled compendium in the field provides an up to date account of the chemistry of solids nanoparticles and hybrid materials Following a valuable introductory chapter reviewing important synthesis techniques the handbook presents a series of contributions by about 150 international leading experts the Who's Who of solid state science Clearly structured in six volumes it collates the knowledge available on solid state chemistry starting from the synthesis and modern methods of structure determination Understanding and measuring the physical properties of bulk solids and the theoretical basis of modern computational treatments of solids are given ample space as are such modern trends as nanoparticles surface properties and heterogeneous catalysis Emphasis is placed throughout not only on the design and structure of solids but also on practical applications of these novel materials in real chemical situations

Navy Research Task Summary United States. Office of Naval Research, **Engineering Dielectrics, Volume IIA, Electrical Properties of Solid Insulating Materials** R. Bartnikas, R. M. Eichhorn, 1983-12-31

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Metaphors: "Wearing an open-necked shirt (borrowed from Mr. Meier) and blue jeans rolled up at the cuffs, [Perry] looked as

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