

Solid State

Types of solids

Crystalline solid	Amorphous solids
- Definite & regular arrangement - True solids - Long ordered arrangement of particles - These are anisotropic - Sharp M.P - Clean cleavage cut - Ex - NaCl, KCl	- Doesn't have regular arrange - Pseudo solids or super cooled liq - Short ordered arrangement - These are isotropic - Melt over certain range of temp - Irregular cleavage cut - Ex - glass, rubber

Isomorphism - Two or more substance having same crystal structure
 - same atomic ratio
 Ex NaF & MgO - 1:1
 NaNO₃ & CaCO₃ - 1:1:3

Polymorphism - A single substance that exists in two or more forms of crystalline structure
 Ex Calcite & aragonite are forms of calcium carbonate
 Ex - α-quartz, β-quartz & cristobalite - three forms of silica
 - Polymorphism occurring in elements are called allotropy
 Ex Carbon - diamond, graphite, fullerene.

Classification of crystalline solids

1) **Ionic** - Electrostatic force of attraction
 Ion - Ion force
 - Brittle, hard, high melting point
 - non conductors of electricity "when dissolved or melted in water."
 Ex - NaCl, KCl, MgCl₂

2) **Molecular** -
 - Dispersion / Dipole-Dipole / H-Bond
 - Soft, low melting point
 - non conductors & good insulators
 Ex H₂O, Br₂, CO₂, CH₄

3) **Covalent** -
 - Covalent Bond
 - Hard, high melting point, B.P
 - Most incompressible
 - Poor conductor
 Ex - C-diamond, SiO₂, BN, Carborandum

4) **Metallic** -
 - Metallic Bond
 - Variable hardness, M.P, conductivity
 - They are malleable, ductile & good conductors
 Ex - Na, Zn, Cu, Fe

Crystal Lattice - Lattice is a geometrical arrangement of points in 3D form such constituent particles that are attached to the lattice points are crystal lattice

Unit Cell - The smallest repeating structural unit of a crystalline solid



Ex of unit cell.

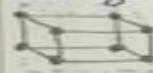
1) **Simple or primitive unit cell**
 - Particles are present at corners only

$$8 \times \frac{1}{8} = 1 \text{ atom}$$

2) **Face centered** - The particles are present at the corners & also at the center $6 \times \frac{1}{2} = 3 \text{ atom} + 1 \text{ atom} = 4 \text{ atoms}$

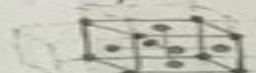
3) **Body centered** - The particles are present at the corners as well as at the centre of the unit cell
 $8 \times \frac{1}{8} = 1 + 1 \times 1 = 1 + 1 = 2 \text{ atoms}$

Note -
 • An atom at the corner is shared by eight unit cell - $\frac{1}{8}$
 • An atom at the face is shared by two cell - $\frac{1}{2}$
 • An atom at the body centre of a unit cell belongs entirely to it - 1



$$8 \times \frac{1}{8} = 1$$

1 atom
SC - 1



$$8 \times \frac{1}{8} = 1$$

$$6 \times \frac{1}{2} = 3$$

$$1 + 3 = 4 \text{ atom}$$

FCC - 4



$$8 \times \frac{1}{8} = 1$$

$$1 \times 1 = 1$$

$$1 + 1 = 2 \text{ atom}$$

BCC - 2

Hsc Chemistry Solid State Notes

Michael Brown



Hsc Chemistry Solid State Notes:

Processing and Properties of Advanced Ceramics and Composites IV J. P. Singh, Narottam P. Bansal, Takashi Goto, Jacques Lamon, Sung R. Choi, Morsi M. Mahmoud, Guido Link, 2012-09-28 With contributed papers from the 2011 Materials Science and Technology symposia this is a useful one stop resource for understanding the most important issues in the processing and properties of advanced ceramics and composites Logically organized and carefully selected the articles cover the themes of the symposia Innovative Processing and Synthesis of Ceramics Glasses and Composites Advances in Ceramic Matrix Composites Solution Based Processing of Materials and Microwave Processing of Materials A must for academics in mechanical and chemical engineering materials and or ceramics and chemistry

High Temperature Gas-Solid Reactions in Earth and Planetary Processes Penelope King, Bruce Fegley, Terry Seward, 2018-12-03 High temperature gas solid reactions are ubiquitous on planetary bodies distributing chemical elements over a range of geologic settings and temperatures This volume reviews the critical role gas solid reactions play in early solar system formation volcanism metamorphism and industrial processes The field evidence experimental and theoretical approaches for examining gas solid reaction are presented building on advances in fields outside of Earth Sciences Computational chemistry techniques are used to probe the nature of molecular clusters and solvation in volcanic vapors and mineral gas reaction mechanisms Specialised analytical methods for characterising solid reaction products are included since these reactions commonly form thin or dispersed films and metastable minerals Finally the volume contains rich field examples laboratory experiments and thermodynamic modelling and kinetics of gas solid reactions on Earth Venus and beyond

Minerals at the Nanoscale F. Nieto, K.J.T. Livi, 2013-05-24 The editors have gathered in this book reviews of past and current studies of mineral groups that have played important roles in geology environmental science and health science The various chapters cover the application of TEM and related techniques to mineral groups in which TEM investigations have been extensive and crucial to the understanding of their mineralogy namely pyriboles serpentines clays micas and other metamorphic phyllosilicates oxides and oxyhydroxides sulfides and carbonates Some research fields for which TEM is particularly suitable and which have produced significant advances in particular are inclusions and traces extraterrestrial material deformation processes non stoichiometry and superstructures and biominerals Nowadays we are witnessing the push for the improvement of detectors for imaging direct detection of electrons and X rays silicon drift detectors and annular high solid angle of collection detectors the development of new support materials e g graphene and liquid cells for TEMs Most of these new technologies have not yet been applied to mineralogical problems but we hope they will be in the near future

Fundamentals of Inorganic Chemistry Bruce E. Wilcox, 1997-07 *Resources in Education*, 1977

Fourth International Symposium on Recycling of Metals and Engineered Materials Donald L. Stewart, Jr., James C. Daley, Robert L. Stephens, 2013-09-12 This proceedings collection continues the tradition established by earlier TMS Recycling Meetings in this series by presenting

fundamental and practical aspects of recycling metals and engineered materials Russian Journal of Physical Chemistry
,1985-09 *General and Inorganic Chemistry* Philip John Durrant,1939 Comprehensive Dissertation Index ,1984
Bulletin of the Chemical Society of Japan Nihon Kagakkai,1969 **Rock-forming Minerals** J. F. W. Bowles,R. A.
Howie,D. J. Vaughan,J. Zussman,1978 Volume 5A of this second edition of Rock Forming Minerals focuses on oxides
hydroxides and sulphides Since the publication of the first edition in 1962 there has been an enormous increase in the
literature devoted to these minerals This new edition greatly expanded and rewritten covers aspects that include crystal
structures chemical compositions electronic structures phase relations thermochemistry mineral surface structure and
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Daily ,2000-10 **Forthcoming Books** Rose Arny,1992 **Australian Books in Print** ,1984 International Books in
Print ,1995 Barbara Hopkinson,[Anonymus AC01401231],1995 *Who's who in the South and Southwest* ,2005 Includes
names from the States of Alabama Arkansas the District of Columbia Florida Georgia Kentucky Louisiana Mississippi North
Carolina Oklahoma South Carolina Tennessee Texas and Virginia and Puerto Rico and the Virgin Islands **Catalog,**
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