

Καταστάσεις της Ύλης



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Abstract

Consists of the chapters: 1. Introduction to the states of matter. 2. Solids. 3. Chronological Review, Alloys, Preparation - Structure - Properties - Performance. 4. Real gases and liquids. Chapter 1. Introduction to the states of matter. 1.1 "Elementary" particles. 1.2 States of matter, among them: solid, liquid, gas, plasma, BEC. 1.3 State (or "phase") transitions. Phase diagrams. 1.4 Bose - Einstein condensate. 1.5 Classification of solids into periodic crystals, quasi crystals, amorphous and fractals. 1.6 Classification of liquids and gases into ideal and real. 1.7 Atomic structure. 1.8 Shape of atomic orbitals. Symmetries. 1.9 Bonds between atoms. Hybridization. 1.10 References of the 1st Chapter. Chapter 2. Solids. 2.1 Basic notions of crystal lattices and crystals. 2.2 Symmetry of lattices and molecules. 2.3 Classification of point groups. 2.4 Crystals. Crystal lattices in 1, 2, 3 dimensions. 2.5 Reciprocal lattice. 2.6 Lattice lines, lattice planes, Miller indices. 2.7 Carbon allotropes. 2.8 Solids. 2.9 Classification of solids

with various criteria. 2.10 References of the 2nd Chapter. 3. Chronological Review, Alloys, Preparation - Structure - Properties - Performance. 3.1 About materials. 3.2 Chronological Review: Paleolithic Age, neolithic Age, Copper Age, Iron Age. 3.3 Examples of composite materials (alloys) known from antiquity as well as modern ones. Doping and thermal processing. 3.4 Preparation (or processing or synthesis). Structure. Property. Performance. 3.5 Examples of structure to properties relation. 3.6 References of the 3rd Chapter. 4. Real gases and liquids. 4.1 Size of atoms and molecules. 4.2 Virial expansion or equation of state. 4.3 van der Waals equation of state. 4.4 van der Waals equation of state into Virial form. 4.5 Isothermal compressibility. Coefficient of cubic expansion. 4.6 Ideal gases laws. Ideal gas isotherms. 4.7 Theoretical isotherms of a real gas. 4.8 Experimental isotherms. Gas - liquid phase transition. Latent heat. 4.9 Lennard - Jones potential energy. 4.10 References of the 4th Chapter. Exercises. Appendices. Bibliography.

