Preface.

We ask readers to excuse us for temporary inconvenience. The ENERGYDURABILITY website will be reconstructed by the author taking into account new theoretical and practical results accumulated over a long period of time.

A new analytical tool, a new method for testing the physical and mechanical parameters of a material, a universal physical characteristic - the volume derivative of the specific energy of a deformed solid, also called the generalized specific power of the process of changing the shape during indentation, or briefly - the physical hardness of the material - is used in the physical theory of strength and hardness. This is a new universal physical and mechanical characteristic of the state of a material during its deformation and destruction, analytically it is unambiguously related to the usual empirical standard parameters of the hardness number, tensile strength, brittleness, etc.

My independent work on the theory, as an independent researcher, is not funded by any organizations. You can help me speed up the work process if you order the specific theoretical material you need (article, abstract, lecture, etc.). To do this, you need to send an order to the author of the theory and the site Nikolay Shtyrov by E-mail: n47068779@gmail.com. The Order Form is attached below.

Previous theoretical results, methods, etc. published on the ENERGYDURABILITY site before 2022 require additions and corrections to many concepts, designations, definitions, etc. have changed. These works will be consistently carried out within the framework of NEW-CONCEPTION - ED, but the originals are stored in the archive of the first version of the site.

Synopsis

Physical criterion of hardness, strength, brittleness of material, method of analysis of indentation and uniaxial tension diagrams, calculation of standard and universal physical parameters.

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Preface.

In the process of many years of work on the physical kinetic structural-energy theory of strength, I came to the conclusion that the most effective approach to the study of physical and mechanical characteristics of materials is based on the use of analysis of experimental data obtained from the results of kinetic indentation. New methods are effective and adapted for testing materials directly in the elements of existing critical and unique structures. The latter is an urgent engineering and scientific problem, which is actively dealt with by leading specialists in developed countries. The results of physical and analytical research of modern methods of

measuring hardness and kinetic indentation tests of materials are the basis of my work on the creation of new methods for theoretical assessment of strength, durability, brittleness of materials. This work shows the possibilities of practical application of the physical structural-energy kinetic theory of strength. The results of my theoretical research in the field of physical theory of hardness, theses of new universal methods and examples of solving applied problems are presented, a small part of the materials was published earlier.

Abstract.

The paper theoretically and experimentally substantiates the physical criterion of hardness and strength of the material: specific generalized volumetric power, specific rheological molar power of change in energy density in a deformed solid. Universal physical and mechanical characteristics and parameters are obtained for kinetic indentation and uniaxial tension until failure of the material. Function of state of a deformed solid, physical universal unit, standard of material hardness. Relationship between physical and standard empirical hardness. Calculation of strength parameters, hardness of the material using the method of physical analysis of kinetic indentation and uniaxial tension diagrams. Experimental and analytical method for assessing physical and standard empirical parameters of strength, plasticity, fracture, hardness, brittleness of materials. Simplified technology, algorithms for complex testing of material parameters in elements of an operating structure based on kinetic indentation data,.

Key words: physical hardness and strength, function, number, universal physical unit of hardness, theory, methods, kinetic indentation, application.

The aim of the work is to present the results of theoretical and experimental substantiation of a new universal physical and mechanical characteristic of a material - the specific generalized power of irreversible processes or the physical hardness of a material. The state function is a new physical characteristic and quantity, a universal unit of strength and hardness measurement. Analytical description of the process of deformation and destruction of solids by means of a physical model of a quasi-equilibrium state of a solid, presented as an associated interaction of a macroscopic set of quasiparticles, vortices, waves of different energies, specific powers, forming a torsion energy field in the volume of a deformed solid. To show the theoretical and analytical relationship between physical hardness and standard empirical parameters of strength, plasticity, hardness, brittle fracture of materials. Principles of simplified kinetic indentation technology and methods of physical analysis of the indentation force diagram, universal algorithms for operational testing and analysis of the state of hardness, strength, durability, brittleness of materials in structural elements.

Solution method. Using the physical theory of strength of solids, analysis and generalization of the properties of standard material test diagrams by UTM and KI methods, a universal characteristic of the material, the state function - the specific power (speed) of the process of changing the density of dissipated energy and body shape change is substantiated. In particular, the macro physical indentation hardness (hereinafter PHI) is considered in the work. This function is universal, applicable for the analysis of KI and UTM. An analytical relationship is obtained between the physical parameters of the material and the values of the parameters of the standard empirical hardness (EH), standard indicators of mechanical strength.

The results of the physical analytical analysis of the standard F(h) diagrams obtained as a result of testing KI steels, the analysis of the Ϭ(Ɛ) diagram for uniaxial tension, where Ϭ are conditional stresses and Ɛ are relative deformations. Promising technologies, methods, algorithms for experimental and theoretical testing of universal physical parameters of hardness, durability, plasticity, strength, brittleness of the material, using kinetic indentation data are discussed.

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