COULOMB CRYSTALS IN NEUTRON STARS AS HARD ASTROMATERIALS

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ABSTRACT

Astromaterials, including neutron stars, have extraordinary properties in terms of very high densities, very large gravity, and magnetic field, and may have an incommensurate crystalline structure that could be composed of neutrons and protons. Neutron crystallization has been studied extensively, but the existence of Coulomb crystals in neutron stars is still to be studied to have a better idea of the crystallization of neutron stars and other types of astromaterials, such as black holes and white dwarfs (WD). Properties of Coulomb crystals in neutron stars are studied in this manuscript to have some idea of the structure of some hard astromaterials and their incommensurate nature.

ENERGY, INFORMATION AND TECHNOLOGIES

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ABSTRACT

The article gives the promising approach of Prof. Seth Lloyd, which made it possible to describe the interaction of objects with each other and with energy fields of the Universe of any nature as elementary logical operations, supplemented by resonance and an explanation of quantum teleportation from the standpoint of Lev Sapogin's Unitary Quantum Theory. It is indicated that to multiply the speed of processors and significantly reduce power consumption, other materials are needed and new technology for their production.

EFFECT OF NANO-Al_2O_3 ON MECHANICAL AND DURABILITY PROPERTIES OF CEMENT-BASED MATERIALS

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ABSTRACT

Cement-based materials are regarded as one of the most important building materials due to their simple construction process, low energy consumption, and the wide range of raw materials from which they can be synthesized. This paper presents a state-of-the-art review of published results of promising new research and innovation of cement-based materials using nanotechnology, which lead to improved physical-mechanical properties, durability, and sustainability of these materials. The development of nanoscience has a significant impact on building materials. The application of nanomaterials has shown that the properties of conventional cement-based materials can be significantly improved when nanoparticles are included. The addition of nanoparticles in these materials can act as a filler agent, producing a

dense matrix and reducing the growth of micro pores. The incorporation of nanomaterials into cement matrix has become a promising area of research. Nano-sized particles are characterized by a high surface area to volume ratio, and many of them are highly reactive. The incorporation of nanoparticles into the cement matrix significantly improves its properties due to the reactivity of nanoparticles and the filling of matrix nanopores. Understanding the complex structure of cement-based materials at the nanoscale leads to the creation of a new generation of these materials, stronger and more durable, with the desired deformation-stress behavior and, possibly, with a full range of "smart" properties. Aluminum oxide (Al_2O_3) nanoparticles are among the most important metal oxides with promising applications. The role of nano-Al_2O_3 in improving the physical and mechanical properties of cement-based materials has been noted by many researchers. This article summarises and discusses current knowledge and the latest research regarding the use of aluminum oxide in cement-based materials.

APPLICATION OF THERMOCHEMICAL METHODS FOR THE STUDY OF CELLULOSE AND CELLULOSE ESTERS

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ABSTRACT

In this research, the enthalpy of the interaction of cellulose and cellulose esters with various polar liquids was studied. Besides, the standard enthalpies of combustion and formation of cellulose and its esters were determined. It was shown that the absolute value of the standard enthalpy of the interaction of cellulose with the polar liquids is an indicator of the accessibility of the supramolecular structure for these liquids. It has been also established that the interaction enthalpy of cellulose materials with water, i.e., wetting enthalpy, is directly proportional to the content of non-crystalline domains and inversely proportional to the degree of cellulose crystallinity. In the case of cellulose esters, the wetting enthalpy characterizes their substitution degree and hydrophobicity, which are the higher, the lower the absolute value of the exothermic wetting enthalpy. The determination of the standard enthalpies of combustion and formation of cellulose and the melting heats of crystallites was carried out to evaluate the relative thermodynamic stability of CI, CII, CIII, and CIV crystalline forms and amorphous cellulose. For esters of cellulose, it was shown that an increase in the degree of substitution contributes to enhancing the exothermic enthalpy of the formation; thus, the esterification of cellulose is thermodynamically favorable

RELIABILITY OF BOOSTER COMPRESSOR STATIONS OPERATED BY THE STATE OIL COMPANY OF THE AZERBAIJAN REPUBLIC

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ABSTRACT

The article discusses the identification of the reasons for low reliability and the physics of failures of parts that affect the trouble-free operation of a booster compressor station. In

operation, the plant readiness factor is calculated by taking into account the operating time and recovery time using the "control vector". The main indicator for managing and ensuring the reliability of the BCS-2 during operation is necessary and sufficient to use a comprehensive indicator of the reliability of the readiness factor.