

THE STRUCTURE AND DIFFRACTION BY NANOTUBES

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ABSTRACT

The method of description of structures of non-chiral, chiral and scroll nanotubes of arbitrary chemical composition is developed by transformation of plane analogue's atom coordinates to cylindrical coordinates on the corresponding surface. The description uses such concepts as cylindrical lattice, Bravais cell and chiral indexes, expressed in terms of these cells. The quantitative theory diffraction is developed, the pseudoorthogonality effect, earlier investigated experimentally, is considered. The effect is associated with additional scattering by atom circles of nanotube and has not analogues in diffraction by usual crystals. The models of lattices and theory diffraction by goffered nanotubes (cylindrical superlattices) and radial cylindrical crystals formed at sorption of atoms on a cylindrical substrate are proposed. The diffraction of short-wave radiation (x-ray, particle with corresponding energies) in an internal hole of circular lattice is considered, the effect of concentration of radiation on the nanotube's axis is shown. The developed results associate with waveguide effect having, as against traditional, the diffraction nature.

ETHICAL PROBLEMS OF NANOTECHNOLOGIES AND NANOMATERIALS

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ABSTRACT

Nanotechnologies and relevant knowledge are quickly occupying the first place in scientific-technical progress, promising to become one of the leading directions of the world science and economy in the future. Already today nanotechnologies are used in different spheres of industry, medicine, ecology, power engineering, military, information and telecommunication fields as well as in everyday life. Different aspects of nanotechnologies have become a subject of scientific and public discussions. At the same time representatives of different fields have different understanding of economic, social, legal and ethical consequences of nanotechnologies and propose different approaches and means to solution of problems connected with their implementation. Even though there are many ethical approaches which are rather efficient for making concrete solutions, peculiarities of new nanotechnologies can be a cause for reconsideration of ethical principles (for example of a principle of differentiating treatment and improvement in medicine) and even for development of new profile directions of ethics which will be responsible for new technologies. The article proposes to consider one of the instruments of nanotechnologies ethical regulation, namely nanobioethics.

PHYSICAL MECHANICS OF MICROPARTICLES SUPERDEEP PENETRATION INTO METALS

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ABSTRACT

Chemical elements formation in technically pure iron in the process of solid microparticles penetration in super-large depths, far exceeding the 100 caliber of a penetrating particle has been studied. Formation of Mn, S, Na, Cu, Al, Ne, Rn, etc. isotopes, which were absent in initial metals and microparticles, was detected in metals treated in the mode of the microparticles superdeep penetration (SDP). The depth of the microparticle penetration into metal targets according to numerous experiments exceeds its lateral dimensions of 10^2 - 10^4 times. The maximum depth of the penetration recorded in experiments was 300 mm. It was established experimentally that the output of the microscopic plasma jet takes place before the escape of every microparticle from the back side of the target, that can be the real damaging factor of a spacecraft – depressurization, the failure of electronic systems, etc. It is assumed that the microparticle in a plasma cover is a physical object that could overcome long distances in a variety of substances, including solids. The microparticle without the plasma cover under high-speed collision could penetrate into the other solid at the depth of not more than a few diameters of these particles. Developed method of dynamic action on materials and obtained results could potentially be used in the design and development of new energy sources, principally new methods of the controlled mass synthesis of chemical elements involving heavy nuclei and nuclear waste.

CORROSION INHIBITORS PATENTS IN INDUSTRIAL APPLICATIONS

Review

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ABSTRACT

Corrosion affects the quality of the environment, the durability of the infrastructure assets and industrial equipments. Therefore, it is crucial to apply corrosion engineering control methods and techniques, in particular safe green corrosion inhibitors that will extend the life of the infrastructure saving large expenses in materials equipment and structures. This review-presents an analysis of patents on corrosion inhibitors developed for aqueous systems, steel reinforced concrete, acid pickling operations, oil industry and additives in the formulation of protection coatings.