

modern conditions designers have to offer more and more new ways of protection against radiation not only the ship, but also the person working in open space.

Specifics of radiation in space unlike work at the enterprise, is that "during space flights impact of solar radiation on all body is the most probable". The risk of radiation of crew forces to watch constantly solar activity by means of land services and onboard indicators. And in case of solar flash, crew members have to pass into the most protected places of the ship.

Thus, the heliobiology at the moment is one of sciences helping with space exploration by the person as observation of solar activity allows to predict emergence of electromagnetic storms on Earth and ensures safety of crew members of spaceships.

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### STRUCTURE AND CONTENT OF SERVER DATABASE OF RENEWABLE ENERGY EQUIPMENT AND POTENTIAL OF RENEWABLE ENERGY SOURCES

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Some characteristics and features of structure and content of server database of renewable energy equipment and potential of renewable energy sources are considered, that is created in the framework of the state program of scientific research "Informatics, space and security" and is integral part of integrated information system for analysis of potential of renewable energy sources, which realize computational methods and mathematical models at various territorial levels and is based on geoinformation technologies.

*Keywords:* server database, renewable energy equipment, potential of renewable energy sources.

Based on the analysis of the contents of the server database of renewable energy equipment and the potential of renewable energy sources as part of an integrated information system for analyzing of the potential of renewable energy sources, the information that needs to be stored in it can be classified as follows:

- objects' data (geographical coordinates, installed equipment, potential of renewable energy sources and so on);
- meteorological and climatic data (average monthly amount of direct and diffuse solar radiation for each hour of a cloudless sky, average monthly wind speed, hourly average ambient temperature for each month, information needed to calculate the energy and economic efficiency of using renewable energy sources and so on);
- reference data about equipment produced by various manufacturers (technical parameters and characteristics, information about manufacturers and so on).

As the tools with which this database was developed, the Microsoft SQL Server database server and the Microsoft SQL Server Management Studio database management system were chosen. With the help of these tools the general relational data scheme and different internal objects for storing information about the parameters and characteristics of the equipment being produced in the field of renewable energy sources were developed.

The database stores the following information about:

- parameters of equipment used in the field of renewable energy, based on the values of which various analytical calculations are made of the effectiveness of its use;

- objects for effective analysis: the geographical location of the settlement, the amount of resources available at the facility and the installed equipment (location, type and size of each object, the main information about objects, the belonging of an object to an area and region and the type of object);
- equipment installed at the facilities (the link between the object table and the tables that store information about the equipment and the organization of storage of information about the equipment installed at the facility by adding an entry to the appropriate link table containing information about the identifiers of the object and equipment manufacturers, the names of the installed models and their number);
- weather and climate data to carry out analytical calculations in the database (the specific heat flux of direct and scattered solar radiation incident on the horizontal surface unit in each hour of the cloudless sky (by months, depending on the time of day), the monthly average values of the ambient temperature of the air for each hour, monthly mean wind speeds and surface roughness coefficients for a particular area);
- resources available when assessing the efficiency of the use of biomass and wind energy (terrain on each object, the availability of wood fuel available for use and the amount of bio-mass available for use in biogas plants).

Thus, developed structure and content of server database of renewable energy equipment and potential of renewable energy sources will allow filling with data and integrating database into information system for analysis of potential of renewable energy sources, which realize computational methods and mathematical models at various territorial levels and is based on geoinformation technologies.

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## HARDNESS

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This article deals with the hardness of substances. Methods of determination and methods of studying hardness. Also, the hardness scale will be considered and a substance that is harder than diamond will be found.

*Keywords:* hardness, indenter, hardness, material, hardness scale, Brinell method, Rockwell method, Vickers method.

Hardness-the property of the material to resist elastic and plastic deformation or destruction when introduced into the surface layer of the material of another, more solid and not receiving the residual deformation of the body – indenter.

The most common methods for determining the hardness of metals are those based on indentation of an indenter in the form of a steel ball (Brinell and Rockwell methods), a diamond in the form of a pyramid (Vickers method) or a diamond with a round top (also the Rockwell method) in the test sample.

Brinell method – one of the main methods for determining the hardness of materials, based on the indentation into the surface of the test material of a metal ball of hard alloy with a certain diameter and further measurement of the diameter of the resulting print. As indentors used balls of hard alloy with a diameter of 1; 2; 2.5; 5 and 10 mm. the Magnitude of the load and the diameter of the ball is selected depending on the material under study. At the same time, the materials themselves are divided into 5 main groups: steel, Nickel and titanium alloys; cast iron; copper and copper alloys; light metals and their alloys; lead, tin.

Rockwell method-a method of non-destructive testing of the hardness of materials. It is based on the measurement of the penetration depth of the solid tip of the indenter into the test material with the application of the same load for each hardness scale, depending on the scale, usually 60, 100 and 150 kgf.

As indentors in the method, strong balls and diamond cones with an angle at the top of 120 with a rounded sharp end are used.

Because of its simplicity, speed compared to other methods and reproducibility of results, it is one of the most common methods of hardness testing of materials.

The Vickers method is a method of measuring the hardness of metals and alloys based on pressing into the test material of a regular tetrahedral diamond pyramid with an angle of 136° between opposite faces. In this case, the hardness value itself is calculated by dividing the applied load by the surface area of the resulting pyramidal imprint.

This measurement method is suitable for determining the hardness values of parts of small thickness of ferrous and non-ferrous metals and alloys; parts hardened to a small depth, as well as parts with thin layers of galvanic coatings. The main disadvantage of the Vickers method is the dependence of the measured hardness on the applied load or the depth of the indenter introduction (the phenomenon of the size effect).