Литература

1. Способ изготовления полого композиционного изделия : пат. С1 Респ. Беларусь, МПК B 22F 7/02 B 21 D 22/20 B 22 F 3/10 / Стрикель Н. И., Бобарикин Ю. Л., Лискович М. И. – № 10955 С2 ; заявл. 16.05.05 ; опубл. 30.08.08 // Офиц. бюл. «Изобретения, полезные модели и промышленные образцы». – № 4 (63).
2. Теоретическое исследование условий, благоприятно влияющих на образование прочного соединения покрытия и основы в процессе совместной вытяжки / Н. Г. Малашков, М. И. Лискович // Современные проблемы машиноведения : материалы XIII Междунар. науч.-техн. конф. (науч. чтения, посвящ. 125-летию со дня рождения П. О. Сухого), Гомель, 22 окт. 2020 г. / М-во образования Респ. Беларусь, Гомел. гос. техн. ун-т им. П. О. Сухого, ПАО «Компания» «Сухой» ОКБ «Сухого» ; под общ. ред. А. А. Бойко. – Гомель, 2020. – С. 320–323.

UDC 539.17

INTERNATIONAL NUCLEAR DATA CENTERS NETWORK AND PROSPECTS OF ITS USE IN NUCLEAR POWER IN BELARUS

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We give a brief overview of the existing nuclear data base, and describe the structure of the International Nuclear Data Centres Network. Because the amount of experimental data in nuclear physics is extremely large, the note aims to show the way to modern methods of acquaintance with the characteristics of arrays of nuclei through the nuclear data banks accessible through the Web-technologies. In particular, the note describes the methods to extract information on the nuclei and nuclear reactions in nuclear data banks. The data include information on the masses and energies of the nuclei of the separation energy of nucleons and clusters, the spectra of states of nuclei, their spin, parity, isospin, charge and mass radii and densities, information about the shape of the nuclei, the cross sections of nuclear reactions, the decay of unstable nuclei. On the completeness and accuracy of the data depends on radiation and nuclear safety, and environmental acceptability of nuclear installations. Creating a nuclear databases in Belarus will monitor the quality of nuclear data supplied to consumers, and ensure that systems of constants, used in technical projects, the current international standards.

Keywords: nuclear data centre, nuclear power.

Nuclear data are quantitative results of scientific investigations of the nuclear properties of matter. They describe properties of atomic nuclei and the fundamental physical relationships governing their interactions, thereby characterizing the physical processes underlying all nuclear technologies. Examples of nuclear data include cross sections, half-lives, decay modes and decay radiation properties, and γ-rays from radionuclides. The scope of the data collections includes all 85 natural elements with 290 stable isotopes and more than 2500 radionuclides.

The applications of nuclear data include all areas of nuclear science and technology, covering energy applications (fission reactor design; nuclear fuel cycles; nuclear safety; reactor monitoring and fluence determination; waste disposal and transmutation; accelerator driven systems; fusion device design and plasma processing technologies) as well as non-energy applications (cancer radiotherapy; production of radioisotopes for medical and industrial applications; personnel dosimetry and radiation safety; nuclear safeguards; waste disposal and transmutation; environmental monitoring and clean-up; materials analysis and process control; radiation damage studies; detection of concealed explosives

and illegal drugs; exploration for oil and other minerals) and basic research (e. g. nuclear astrophysics) and education. For details of the review of nuclear data for applications and original references, see Tsytrinov A. V., Pankov A. A., Serenkova I. A.: 2015.

1. Data Access and Services. Various data distribution media are offered by NDS, including WWW, CD- ROM and hardcopies in order to serve the diverse needs of users from both developing and fully industrialized counties. A nuclear data "mirror server" has been established at IPEN in Brazil to improve on-line access for Latin America by providing WWW, FTP and Telnet access to the IAEA nuclear data services.

WWW: "Nuclear Data Services" web-site of the IAEA can be accessed through http://www-nds.iaea.org (IAEA Vienna) or http://www-nds.ipen.br/ (Brazil mirror server). Contains links to most data libraries, electronic documents, nuclear data programs, general information, and much more. Some data are available also by FTP and/or a Telnet-based on-line retrieval system.

Handbooks: A number of nuclear data handbooks have been produced by NDS (some of them are priced IAEA publications), including hardcopy versions of the CINDA bibliography of neutron data, and a Handbook on Nuclear Data for Safeguards; normally, the results of a Co-ordinated Research Project on nuclear data are published within the IAEA-TECDOC series.

Reports: NDS publishes informal reports in the INDC series, containing meeting summaries, unpublished nuclear data works from member states, and translations from Russian literature; most recent reports are available electronically on the NDS website.

Nuclear Data Newsletter is published biannually, and serves as the primary medium for current awareness of new nuclear data available from NDS; available in hardcopy and from the web.

Custom retrievals and other mail services can be requested by informal e-mail to services@iaeand.iaea.org.

2. Creation of a nuclear data center at Gomel State Technical University (GSTU). The activity on the development of Scientific, Methodological and Information Basis for Nuclear and Technological Calculations had been started in 2013 in the framework of joint Project of Ukrainian Nuclear Data Center (UkrNDC) at the Institute for Nuclear Research of NAS (Ukraine) and Laboratory for Physical Studies at the GSTU (Gomel, Belarus). The name of the Project was "Accumulation, Processing, Systematization and Analyses of Information in the Nuclear Power as the basis to found the Information Nuclear Data Center".

Fourteen Webpages of the Nuclear Data Information Center (in Russian and English) at GSTU were developed and performed by Dr. O. O. Grizay. In most cases, the Russian and English versions of the pages are identical, with the exception of the "MANUAL" pages.

Nuclear data are commonly categorized in two main groups: nuclear reaction data, describing the interactions of various projectiles such as neutrons, protons or photons with target nuclei, and nuclear structure and decay data, describing nuclear levels, half-lives and radioactive decay radiations. For evaluated data (both numeric) or bibliographic.

Bibliographic data: References with some description of the contents, but no numerical data. Examples are CINDA (Computer Index of Neutron Data) and NSR (Nuclear Science References).

Experimental data: Results of individual measurements as reported by the authors. The most important example is EXFOR/CSISRS, the library for experimental nuclear reaction data.

Evaluated data libraries contain recommended data based on all data available from experiments and/or theory, arrived at after critical analysis of experimental data and their uncertainties, inter- and extrapolation, and/or nuclear model calculations. They are stored in strictly defined formats such as ENDF-6 (the international format for evaluated nuclear reaction data) or ENSDF (the format of the Evaluated Nuclear Structure data File). The main cross section libraries in ENDF format usually also contain the relevant decay data needed in the main applications.

Nuclear reaction data include cross sections, angular and energy distributions of secondary particles, resonance parameters, and related quantities. For neutron-induced reactions up to 20 MeV, the libraries are very complete; the coverage for higher energies is less complete but improving. Experimental data are found in EXFOR, the related bibliography in CINDA; several evaluated data libraries exist up to 20 MeV or higher. For charged-particle induced and photonuclear reactions, selected experimental data are compiled in EXFOR and only few evaluations exist. Heavy-ion data are partly compiled in EXFOR.

3. Overview of Data Libraries at IAEA. The IAEA Nuclear Data Section holds a total of about 100 nuclear data libraries, representing an enormous economic and scientific value. All libraries and the related documentation are available free of charge to scientists in IAEA member states. An overview is given in the document *Index of Nuclear Data Libraries available from the IAEA Nuclear Data Section*. Brief documentations of contents and/or format for most libraries are published in the IAEA-NDS- report series.

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The primary aims of the IAEA Nuclear Data Section are to encourage the development and organize the assembly of a wide range of atomic and nuclear databases, and ensure improvements in technical performance by providing ready access to users in Member States. To make the service more user-friendly and, at the same time, extend the retrieval possibilities, development of a combined nuclear reaction database is under way, using advanced database software, with which the EXFOR, CINDA and ENDF libraries will look like one database to the user. Further improvements under way include increased distribution of databases through the Internet and the creation of additional regional copies of the “Nuclear Data Services” Websites. Creating a nuclear databases in Belarus, in particular in GSTU (Gomel) in closed collaboration with Ukrainian experts is also discussed.

References

1. Pankov, A. A. / A. A. Pankov, A. V. Tsytrinov, I. A. Serenkova // Nonlinear Dynamics and Applications. – 2015. – Vol. 21. – P. 270. DOI: 10.18524/1810-4215.2019.32.182523