Ukrainian Nuclear Data Centre

**Status report to the NRDC Meeting on
the Network of Nuclear Reaction Data Centres**
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Introduction

UKRNDC is operating as the division of the Neutron Physics Department in the Institute for Nuclear Research of the National Academy of Sciences Ukraine. The staff is partly involved in the experimental investigations of neutron cross sections at Kyiv Research Reactor.

Compilation

We continue collection and compilation of new experimental data published in Ukrainian printed sources. As soon as they are ready, they are sent to NDS IAEA to be included to EXFOR library.

This year we started also the compilation of charge particle data works fulfilled in Ukraine. After last meeting in 2001 we prepared three entries 32207, 32208 and 32210.

Collaboration

- We continue our collaboration with Laboratory of Engineering Research and Technology, Slavutych (LERT) in scientific support of Slavutych Nuclear Data Bank and its users. In frame of this activity the teaching course *"The use of codes and special libraries FSX96, VITAMIN-B6, SNLRML, SINBAD-96 for nuclear-physical calculations"* (46 hours) was lectured at this laboratory in September 2001.

- The work under the joint project supported by Science and Technology Center of Ukraine (STCU Project #1648) *Development and support of Nuclear Data Base in Slavutych for decommissioning of Chornobyl NPP reactor units* has started since 1 April 2002. This work is foreseen for three years and this activity is very important for support our UKRNDC work. We are very much obliged to our collaborators, two of them are here: NNDC, USA and NDS, IAEA. Due to their strong support we can plan our activity for next years.

- The teaching course *"Nuclear Data for Science and Technology "*(72 hours) was lectured in 2001-2002 for graduate course students of Kyiv University, Physical Department. This course included the following items: ENDF/B libraries, EXROR system, ENSDF library, the use of PREPRO codes in the work with ENDF libraries, the introduction to NJOY94 (NJOY97) code system, the Network of Nuclear Data Centers and the use of on-line services.

Customer Services

- During 2001-2002 the data for users requests were prepared and adapted (from ENDF, ENSDF and EXFOR libraries, from the special library DAMSIG-84) for our institute researchers and for ones from other institutes (Kharkiv Institute of Physics and Technology, Kyiv National University, Institute of Physics, Kyiv).

- Reconstruction of UKRNDC site is now in progress and the first turn is now in operation. This is the help for our customers, especially for those who wish to prepare the pointwise and multigroup cross sections self-dependently, but do not have a good experience in it. Address: http:\\ ukrndc.kinr.kiev.ua\
  - Set of codes, which is proposed on our site, includes only a part of codes, developed by C.L. Dunford - Utility Codes (CHECKR, FIZCON, GETMAT, PSYCHE) and by D.E. Cullen - PREPRO2000 (LINEAR, RECENT, SIGMA1, GROUPIE) to work with evaluated nuclear data libraries. This choice was based on our experience of work with users - just these codes were in use the most frequently in our practice for users requests on codes and data from libraries. To facilitate the work with these codes we offer to users the short explanatory information in English and in Ukrainian. Of course, we cite address of sites with full sets of these codes.
  - To facilitate the task input file preparation for Cullen's codes LINEAR, RECENT, SIGMA1, GROUPIE we propose on our site the four small codes LIN0, REC0, SIG0, GROUP0.
  - For presentation of the ENDF formatted cross sections (MF=3), obtained after processing with any of codes LINEAR, RECENT, SIGMA1 or GROUPIE, in a table format we offer the PL_ORI code. This code can be used as a very simple and useful tools to prepare input file for the graphical package Microcal^{TM}Origin^{TM} (see http://www/microcal.com), which is very wide used now in Ukraine.

Calculation

- The work on *Neutron Exitation Function Guide for Reactor Dosimetry (NEFGRD)* was fulfilled. This work was carried out in collaboration with the IAEA NDS staff member V.Zerkin. Now NEFGRD is in edition as INDC(UKR) report and is placed on IAEA NDS site. It is available for everybody as PDF-file at the address: http://www-nds.iaea.org/indc_sel.html.
- The calculations of absolute difference in cross sections weighted on Cf-252 and U-235 spectrum for different dosimetry and ENDF/B libraries have been done. Plots of these calculation results are prepared. This work is useful to facilitate the selection process for IRDF-2002 library.
- Special library, including total neutron cross sections of 65 nuclides, for modeling of neutron filters was prepared using ENDF/B-6 and JENDL-3.2. Some of this library files were used with the code FILTER_L for neutron spectra calculation of filters, existing in INR. The results are presented in: *"Neutron Filters at Kyiv Research Reactor", Gritzay O.O., Kolotyi V.V., Kaltchenko O.I., Reprint KINR-01-6, 2001, Kyiv* (see http://ukrndc.kinr.kiev.ua/public/)
- Analysis of self-shielding factors for Cr, Cr-52 and Ni, using all ENDF libraries was fulfilled at several energy ranges. These calculations were carried out with the code

complex DT_GRO, GROUPIE, SELF. The results were used to present the measured cross sections on Cr and Cr-52 samples and will be used in further investigations.

- We started the calculations of damage cross section based on ENDF libraries for reactor structure materials. These data are needed for NPPs operating in Ukraine.

For all calculations of the pointwise and group cross sections we used PREPRO and/or NJOY94/97 package codes.

Experimental Neutron Data Measurements

- The total neutron cross section of Cr and Cr-52 was measured at Kyiv Research Reactor using Neutron Filter Technique. The accuracy of measured cross sections was better than 1%, as it was requested 3% in *The NEA High Priority Nuclear Data List (1998)*. These data for neutron energies 24 and 58 keV were compared with the data from ENDF libraries and presented to ND2001 Conference (Tsukuba, Japan).
- In 2002 this research was prolonged with a set of Cr and Cr-52 samples to investigate the self-shielding effects. These measurements were fulfilled for energies 24 and 58 keV, the results were presented to the Annual Institute Conference and now they are in progress for publication.

Future Plans

Experimental investigations

- To continue the study of the Cr and Cr-52 total neutron cross sections and self-shielding effects for different energies with high accuracy using Neutron Filter Technique (2, 12, 144 keV and other energies).
- The same investigations we plan to start for Ni-nat samples.
- To investigate the total neutron cross section in deep minimum of Mn-55 at 275 keV neutron energy. This minimum is unknown for all Mn-55 data, but it is well seen using Neutron Filter Technique.

Data analysis and calculation

- Analysis of ENDF libraries files for the main RBMK structural elements and comparing with the recent EXFOR and other experimental data with the purpose to develop the specialized library for MCNP code calculations of RBMK decommissioning. This work is planned in the framework of the STCU Project #1648.
- The other analysis of ENDF files is planned for MCNP library additional files for calculation of epithermal neutron source needed in BNCT. This work is supported with CRDF Project # UP2-2437-KV-02, to be started soon.
- We plan to intencify our work in EXFOR compilation also with charge particles and CINDA references by recruiting the young graduates from Kyiv University.

Visits and Conferences

- In October 7-12, 2001 O.Kaltchenko took part in the International Conference on Nuclear Data for Science and Technology (ND2001), with report on new experimental nuclear data on Cr and Cr-52.
- In December 18-21, 2001 L.Chervonna visited NDS IAEA as EXFOR compiler to take part in the consultancy visit "Compilation of the Latest Experimental Data Produced in the Ukraine in EXFOR Format"
- In March 2002 there was a short meeting in Kyiv with Jess Gehin, ORNL, Division of Computational Physics and Engineering, concerning our possible joint activity together with Slavutych Laboratory of Engineering and Technology on the problems of ChNPP decommissioning.