

POSTER SESSION

Basic Physics: Nuclear Data and Experiments and Materials, Fuels and Targets

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SUMMARY

As mentioned during the poster session introduction, research on ADS has incited a revival of interest in nuclear cross-sections of many nuclides in a large energy range with a special interest for the higher energies.

In this poster session, 12 papers were foreseen from which 11 were presented, a success in itself. I will go through each of them following the order of the programme to give you a flavour of what was presented.

The first paper was on the n-TOF experiment at CERN and was concerned with the actual design of the installation, with special emphasis on those aspects particular to the n-TOF: namely the excellent energy resolution and the high-energy spectrum of the neutrons. Worthwhile to mention is that the neutron energy spectrum induced by 20 GeV protons on a lead target, after a 200 m flight path only contain 7% of the neutrons with energies higher than 20 MeV.

The second poster reported on recent capture cross-sections validation on ^{232}Th from 0.1 eV to 40 keV. It was shown that it is possible to determine cross-sections with a precision of 5% by making use of a slowing-down spectrometer associated to a pulsed neutron source. These measurements performed at ISN (Grenoble) with GENEPI show good agreement with ENDF/B-VI and JEF-2.2 in the energy range 10 eV to 40 keV. Discrepancies were observed with JENDL 3.2 in the energy range from 300 eV to 3 keV.

The third poster reported on double differential cross-sections for protons and light charged particles emitted in reactions of 100 MeV neutrons on enriched ^{208}Pb targets. The measurements were performed at Upsalla, Sweden. Preliminary results were presented for different angles relative to the beam.

The fourth paper reported on measured double differential cross-sections of neutrons produced in reactions induced by a proton beam of 62.5 MeV on a lead target. This experiment was performed on the S-line of the CYCLONE facility of Louvain-la-Neuve in Belgium. Results were shown for 5 different angles.

The fifth paper reported on a joint work between Russian and Swedish colleagues. This work focused on neutron-induced fission cross-sections of tantalum, tungsten, lead, mercury, gold and bismuth. Results were presented for 10 different neutron energies ranging from the fission threshold up to 175 MeV.

Paper 6 was entitled: "Neutron Radiative Capture Cross-sections of ^{232}Th in the Energy Range from 60 keV to 2 MeV". This paper reported on the work performed at the 4 MW Van der Graaf of the CEN-Bordeaux. The activation technique was used and the cross-section was measured relative to the $^{197}\text{Au}(n,\gamma)$ standard cross-section up to 1 MeV. The results indicate that the cross-sections are close to the JENDL database for values up to 800 keV and over 1.4 MeV. For energies in the intermediate range, values are slightly lower to the ones from the libraries.

The seventh paper was related to the determination of the neutron fission cross-section for ^{233}Pa from 0.5 to 10 MeV using the transfer reaction technique. This common work of CEN-Bordeaux, CEN-Saclay and ISN-Grenoble is a first attempt to determine the neutron induced fission cross-section of ^{233}Pa in the fast neutron energy range as a product of the fission probability of ^{234}Pa and the same compound nucleus formation cross-section. Although the results are preliminary, they tend to agree with the JENDL evaluation at least for energies greater than 4 MeV.

The experiment described in the eighth paper has been performed at the CYCLONE installation of Louvain-la-Neuve. Double differential cross-sections for light charged particles production in neutron induced reactions at 62.7 MeV on lead target were presented. Special attention was devoted to the correction procedures coming from the use of a thick target and collimators. Measurements were done with good statistics and are in good agreement with other experimental data. The comparison with some well-known theoretical total production cross-sections data still shows large discrepancies. Need for improvements of the theoretical models are still necessary.

The HINDAS project, which was presented as paper 9, will provide similar data for Fe and U. The general objective of HINDAS, accepted within the 5th framework programme, is to obtain a complete understanding and modelling of nuclear reactions in the 20-200 MeV region, in order to build reliable and validated computational tools for the detailed design of the spallation module of an ADS.

The tenth paper was also concerned with an accepted project within the 5th framework programme, namely: the CONFIRM programme. This project aims at investigating the feasibility of a high burn-up, high linear rating uranium free fuel, by means of modelling, fabricating and irradiating transuranium nitride fuels. Some preliminary results from the safety analysis, pellet/pin design and data requirements for irradiation modelling were presented.

Finally, the eleventh paper was concerned with one of the major problems in ADS namely the large burn-up reactivity swing and the consequent unfavourable slanting of the radial power distribution over the depletion period. In this work two concepts of the burnable absorber application were considered, homogeneous and heterogeneous loading of B_4C . The homogeneous application of the B_4C burnable absorber can be effectively used in reducing the burn-up reactivity swing but is not favourable in terms of source neutron multiplication. Loading of burnable absorbers in the outer zones can minimise the parasitic spallation neutron absorption as well as mitigate the slanting phenomenon of the radial power distribution. Outer zone loading leads to longer cycle lengths compared to unpoisoned reference cores.

To conclude, this poster session included new information on cross-section measurement. There is still need for improvement of the theoretical models. New initiatives were presented in terms of programmes and installations and I am looking forward to seeing new results at the next Information Exchange Meeting in Korea.