Progress Report
NUCLEAR REACTION DATA GROUP at ATOMKI

(Nuclear Reaction Data Centre Meeting, NRDC 2012)

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Outline

- The research program
- Experimental works and partner institutes
- Theoretical calculations and partner institutes
- Data compilations and evaluations
- Nuclear data service
- Staff
- Publications in 2010-2012

The research program

- measurement, compilation, evaluation and application of low and medium energy charged particle induced nuclear reaction data.
- Mostly connected to running international projects, to every day applications at ATOMKI and collaborating institutes also initiate data measurements.
- One initiative is the systematic experimental study of activation cross sections of proton and deuteron induced reactions for comparison with the results of modern theoretical codes to establish a more reliable experimental database and to prepare of a general use activation file up to 100 MeV protons and 50 MeV
- Second program is the systematic investigation of nuclear data for production of radioisotopes candidate for use in radiotherapy.

Experimental works and partner institutes

Main application areas

- Activation cross sections for accelerator and target technology and for radiation protection.
- Cross section data for production of medical radioisotopes for diagnostic investigations and for therapy.
- Activation cross sections for Thin Layer Activation Technique (TLA).
- Preparation of a general use CP activation data file.
- Development and upgrade the theoretical codes

Used accelerator facilities

- Institute of Nuclear Chemistry (INC FZ Jülich, Germany)
- Cyclotron Laboratory of the Vrije Universiteit Brussel (VUB, Brussels, Belgium)
- Cyclotron Radioisotope Centre of the Tohoku University (CYRIC, Sendai, Japan)
- Division of Advanced Technology for Medical Imaging of the National Institute of Radiological Sciences (NIRS, Chiba, Japan)
- Radionuclide Production Laboratory of the iThemba Laboratory for Accelerator Based Sciences (Somerset West, South Africa).
- Centre de Ressources du Cyclotron, UCL, (CRC, Louvain-la-Neuve, Belgium)

Theoretical calculations and partner institutes

- Theoretical calculation of the measured data was done mostly in collaboration with scientist from *Institute of Theoretical Physics, IPPE, Obninsk, Russia (ALICE-IPPE, TALYS, EMPIRE)*
- Own calculations (*EMPIRE*)
- Theoretical results from TENDL-2011 library (*TALYS*, *Nuclear Research and Consultancy Group (NRG) Petten, The Netherlands)*

Data compilations and evaluations

EXFOR

- Publications on charged particle induced nuclear reactions with experimental data reported from Debrecen, Brussels and Jülich were compiled in EXFOR format in collaboration with IAEA NDS.
- In the last two years more than 50 paper containing new experimental cross section data were published from the three institutes.

Data compilations and evaluations

CRP and TC participations

- Database for fusion evaluated nuclear data library (FENDL-3, 2009-2011)
- Development of TLA database (2011)
- Accelerator-based Production of Molybdenum/Technetium-99m (2012-2015)
- Development of a reference database for particle-induced gamma-ray emission (PIGE) (2011-2015)-(ATOMKI- Laboratory of Ion Beam Applications

Staff

- The staffs connected to the experimental nuclear reaction data measurement consist of six physicists and two chemists.
- Out of them two (F. Tárkányi, S. Takács) physicists are working in part time on data compilation and evaluation.

Publications and conference talks in 2010-2012

- Papers published in international journals in which our group was involved containing experimental cross section data measured on different target materials bombarded by proton, deuteron, helium-3 and/or alpha particles are around 44.

- 25 presentations at international conferences

Thank you for your attention!

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