

Progress Report of Nuclear Data Group

Atomki, Debrecen,
Hungary

S. Takács, F. Tárkányi,

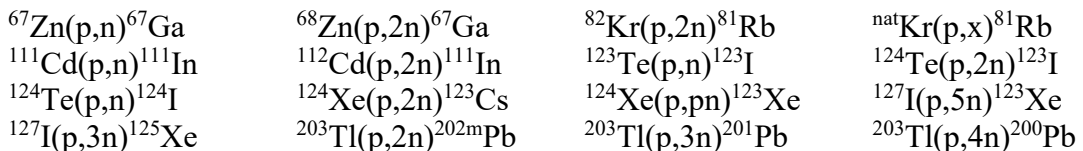
I. Data evaluation work

1., *Charged-particle cross section database for medical radioisotope production Diagnostic radioisotopes and monitor reactions*

Second part of the charged particle cross section database for medical radioisotope production was upgraded. (Chapter 5, Gamma emitters)

The update and upgrade of 16 charged particle induced reactions in which gamma emitter radioisotopes are produced were completed.

The list of reactions:



Experimental microscopic cross section data published earlier and not yet included in the previous evaluation work or new data measured recently were collected and added to the primary database in order to improve the quality of the recommended data. The newly compiled experimental data influenced the decision made earlier and resulted in new selected cross-section data sets. A spline fitting method was applied to the selected data sets and updated recommended data were produced in those cases.

A validation test of the upgraded recommended cross-section database for production of gamma emitter radioisotopes was also performed by collecting experimental integral thick target yields and critically compared with yields deduced from the new recommended cross sections. The yield values calculated from the recommended cross sections were compared with the data of the frequently used compilation work of P.P. Dmitriev, (*Radionuclide Yield in Reactions with Protons, Deuterons, Alpha Particles and Helium-3, Moscow, Ehnergiatomizdat (1986)*), and INDC(CCP)-263/G+CN+SZ (1986)) in those cases for which data were available.

The upgraded data, figures and tables were sent to NDS to update the web version (<http://www-nds.iaea.org/medical>) of the database regarding the gamma emitter reactions. The new updated recommended data were compiled in EXFOR format, in entry no. D4147. The results were also published in a NIM/B article [1].

2. *Nuclear Data for Production of Therapeutic Radionuclides*

We participate in the CRP which was started in 2003 with the aim of to improve the accuracy and completeness of the data needed for the optimum production of therapeutic radioisotopes, to undertake new measurements, to compile and evaluate all experimental data

available on this area, to determine optimum conditions for the production of the selected radioisotopes and to produce accurate cross sections and comprehensive decay schemes for the investigated radionuclides.

II. EXFOR compilation

We continued the compilation work of charged particle induced nuclear reactions in EXFOR format. During the last period 11 new entries were produced with 82 subentries containing data.

Three journals were scanned for publications according to the agreement of the last meeting (NIM/A, NIM/B, ARI) for the years of 2004-2005 and the relevant list of articles were sent to NDS.

III. Experimental work

We continued to measure experimental cross sections of light charged particles (proton, deuteron, ^3He and alpha) induced reactions on various targets. Data are assessed or under process. Results were reported in scientific journals or relevant conferences. See list of publications.

IV. List of publications

1. S. Takács, F. Tárkányi and A. Hermanne, *Validation and upgrading of the recommended cross-section data of charged particle reactions: Gamma emitter radioisotopes*, NIM/B, In Press, Available online
2. Ditrói F., Tárkányi F., Csikai Gy., Uddin M. S., Hagiwara M., Baba M.: *Investigation of activation cross sections of the proton induced nuclear reactions on natural iron at medium energies*. International Conference on Nuclear Data for Science and Technology. Santa Fe, NM, USA, 26 Sept. - 1 Oct., 2004. Proceedings. Eds: Haight, R.C., Talou, P., Kawano, T. et al. AIP (AIP Conference Proceedings 769) 0 (2005)1011
3. Ditrói F., Takács S., Tárkányi F.: *Evaluation of reaction cross section data used for thin layer activation technique*. International Conference on Nuclear Data for Science and Technology. Santa Fe, NM, USA, 26 Sept. - 1 Oct., 2004. Proceedings. Eds: Haight, R.C., Talou, P., Kawano, T. et al. AIP (AIP Conference Proceedings 769) 0 (2005)1654.
4. Hermanne A., Tárkányi F., Takács S., Szűcs Z., Shubin Yu. N., Dityuk A. I.: *Experimental study of the cross-sections of alpha-particle induced reactions on ^{209}Bi* . Applied Radiation and Isotopes 63 (2005)1.
5. Hermanne A., Tárkányi F., Takács S., Szűcs Z.: *Experimental study of the cross sections of alpha-particle induced reactions on ^{209}Bi* . International Conference on

- Nuclear Data for Science and Technology. Santa Fe, NM, USA, 26 Sept. - 1 Oct., 2004. Proceedings. Eds: Haight, R.C., Talou, P., Kawano, T. et al. AIP (AIP Conference Proceedings 769) 0 (2005)957.
6. Hermanne A., Tárkányi F., Takács S., Shubin Yu. N.: *Experimental determination of cross section of alpha-induced reactions on natPd*. International Conference on Nuclear Data for Science and Technology. Santa Fe, NM, USA, 26 Sept. - 1 Oct., 2004. Proceedings. Eds: Haight, R.C., Talou, P., Kawano, T. et al. AIP (AIP Conference Proceedings 769) 0 (2005)961.
 7. Hermanne A., Tárkányi F., Takács S., Shubin Yu. N.: *Experimental determination of cross section of alpha-induced reactions on natPd*. Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 229 (2005)321.
 8. Spahn I., Takács S., Shubin Yu. N., Tárkányi F., Coenen H. H., Qaim S. M.: *Cross-section measurement of the $^{169}\text{Tm}(p,n)$ reaction for the production of the therapeutic radionuclide ^{169}Yb and comparison with its reactor-based generation*. Applied Radiation and Isotopes 63 (2005)235.
 9. Tárkányi F., Ditrói F., Csikai Gy., Takács S., Uddin M. S., Hagiwara M., Baba M., Shubin Yu. N., Dityuk A. I.: *Activation cross-sections of long-lived products of proton-induced nuclear reactions on zinc*. Applied Radiation and Isotopes 62 (2005)73.
 10. Tárkányi F., Takács S., Ditrói F., Csikai Gy., Hermanne A., Uddin M. S., Hagiwara M., Baba M., Shubin Yu. N., Dityuk A. I.: *Measurement of activation cross sections of the proton, deuteron, and alpha particle-induced nuclear reactions on platinum*. International Conference on Nuclear Data for Science and Technology. Santa Fe, NM, USA, 26 Sept. - 1 Oct., 2004. Proceedings. Eds: Haight, R.C., Talou, P., Kawano, T. et al. AIP (AIP Conference Proceedings 769) 0 (2005)1015.
 11. Tárkányi F., Ditrói F., Takács S., Király B., Hermanne A., Uddin M. S., Hagiwara M., Baba M., Shubin Yu. N., Dityuk A. I.: *Cross sections of proton induced nuclear reactions on iridium*. International Conference on Nuclear Data for Science and Technology. Santa Fe, NM, USA, 26 Sept. - 1 Oct., 2004. Proceedings. Eds: Haight, R.C., Talou, P., Kawano, T. et al. AIP (AIP Conference Proceedings 769) 0 (2005)1023.
 12. Tárkányi F., Ditrói F., Takács S., Csikai Gy., Mahunka I., Uddin M. S., Hagiwara M., Baba M., Ido T., Hermanne A., Sonck M., Shubin Yu. N., Dityuk A. I.: *Excitation functions for production of ^{88}Zr and ^{88}Y by proton and deuteron irradiation of Mo , Nb , Zr and Y* . International Conference on Nuclear Data for Science and Technology. Santa Fe, NM, USA, 26 Sept. - 1 Oct., 2004. Proceedings. Eds: Haight, R.C., Talou, P., Kawano, T. et al. AIP (AIP Conference Proceedings 769) 0 (2005)1658.
 13. Tárkányi F., Ditrói F., Takács S., Mahunka I., Csikai Gy., Uddin M. S., Hagiwara M., Baba M., Ido T., Hermanne A., Shubin Yu. N., Dityuk A. I.: *Excitation functions of proton-induced reactions on natSn and natCd: Relevance to the production of ^{111}In and $^{114\text{m}}\text{In}$ for medical applications*. International Conference on Nuclear Data for

Science and Technology. Santa Fe, NM, USA, 26 Sept. - 1 Oct., 2004. Proceedings. Eds: Haight, R.C., Talou, P., Kawano, T. et al. AIP (AIP Conference Proceedings 769) 0 (2005)1662.

14. Uddin M. S., Hagiwara M., Baba M., Tárkányi F., Ditrói F.: *Experimental studies on excitation functions of the proton-induced activation reactions on silver*. Applied Radiation and Isotopes 62 (2005)533.
15. Uddin M. S., Hagiwara M., Baba M., Tárkányi F., Ditrói F.: *Experimental studies on excitation functions of the proton-induced activation reactions on yttrium*. Applied Radiation and Isotopes 63 (2005)367.
16. Uddin M. S., Hagiwara M., Tárkányi F., Ditrói F., Baba M.: *Investigation of the proton-induced activation reactions on natural molybdenum*. Proceedings of the 2003 Symposium on Nuclear Data. Tokai, Japan, 27-28 Nov., 2003. Eds.: T. Ohsawa, T. Fukahori. Vienna, IAEA (JAERI-Conf 2004-005, INDC(JPN)-191/U) 0 (2005)1.
17. Uddin M. S., Baba M., Hagiwara M., Tárkányi F., Ditrói F.: *Measurements of cross-sections of the proton-induced activation reactions*. Proceedings of the 2004 Symposium on Nuclear Data. Tokai, Japan, 11-12 Nov., 2004. Eds.: Y. Tahara, T. Fukahori. Vienna, IAEA (JAERI-Conf 2005-005, INDC(JAP)-195/U) 0 (2005)1.