

## Bibliografia

- 1) Actinide and Fission Product Partitioning and Transmutation Seventh Information Exchange Meeting Jeju, Republic of Korea 14-16 October 2002
- 2) A European Roadmap for Developing Accelerator-driven Systems (ADS) for Nuclear Waste Incineration, Report of the European Technical Working Group on ADS, April 2001
- 3) B. L. Cohen: Disposal of Radioactive Wastes from Fission Reactors, Scientific American June 1977 vol.236, nr.6
- 4) S. Taczanowski: Transmutacje długo-życiowych nuklidów promieniotwórczych wypalonego paliwa jądrowego: Letnia szkoła Energetyki Jądrowej, Warszawa 4-6 Czerwca 2001r
- 5) Ondřej Svoboda, Dissertation Thesis, Experimental Study of Neutron Production and Transport for ADTT, Czech Technical University in Prague, Prague 2010
- 6) U. Reus and W. Westmeier. Catalog of Gamma-Rays from Radioactive Decay. Atomic Data and Nuclear Data Tables 29 (1983) Nos. 1&2
- 7) Evaluated Nuclear Reaction Data File (ENDF). <http://www.nndc.bnl.gov/endl>
- 8) Program liczący energie reakcji: [http://cdfc.sinp.msu.ru/muh/calc\\_thr.shtml](http://cdfc.sinp.msu.ru/muh/calc_thr.shtml)
- 9) J. Motteff at all, Neutron Fluence Measurements, Technical report ser. No 107 (1970)
- 10) O.N.Jarvis, Neutron Detection Techniques for Plasma Diagnostics, Proceedings International School of Plasma Physics, Varenna, Italy 353-382, 1982
- 11) F.D.Brooks, H.Klein, "Neutron spectrometry – historical review and present status. Nuclear Instruments and Method in Physics Research A 476, 1-11, 2002
- 12) G.F. Knoll, Radiation Detection and Measurements, IV edition, Willey
- 13) G. Gilmore, Practical gamm-ray spectrometry, II edition, Willey
- 14) Experimental Nuclear Reaction Data (EXFOR). <http://www.nndc.bnl.gov/exfor>
- 15) J. Adam, K. Katovsky, A.R. Balabekian, A.A. Solnyshkin, V.G. Kalinnikov, V.I. Stegailov, V.M. Tsoupko-Sitnikov, S.G. Stetsenko, M.I. Krivopustov, V.S. Pronskikh, N.M. Vladimirova, and H. Kumawat. Transmutation of  $^{129}\text{I}$ ,  $^{237}\text{Np}$ ,  $^{239}\text{Pu}$  and  $^{241}\text{Am}$  Using Neutrons Produced in Pb-target with  $^{nat}\text{U}$ -blanket System "Energy plus Transmutation" Bombarded by 2.0 GeV Relativistic Protons. Proceedings «International Conference on Nuclear Data for Science and Technology» (26 September – 1 October, 2004, Santa Fe, New Mexico, USA). New York, vol. 2 (2005) 1560
- 16) M.I. Krivopustov, D. Chultem, Ts. Tumendelger at al. Modeling of the Electronuclear Method of Energy Production and Study of Radioactive Waste Transmutation Using a Proton Beam of the JINR Synchrophasotron/Nuclotron. In "Research Program of the Laboratory of High Energies. Editor A.M. Baldin. JINR-Communication 99-266, Dubna, Russia (1999) p.135-139 (po rosyjsku)
- 17) M.I. Krivopustov, **M. Bielewicz** et al. Investigation of Transmutation of Radioactive Waste (I-129, Np-237, Pu-238, Pu-239 and am-241) of Atomic Energetic at Proton and Deuteron Beams of Synchrophasotron and Nuclotron JINR (10-year experience on Dubna base). Proceedings of XIX International Baldin Seminar on High Energy Physics Problems (29 Sep – 4 Oct , 2008) Dubna 2008 Vol.II
- 18) Accelerator-driven Systems (ADS) and Fast Reactors (FR) in Advanced Nuclear Fuel Cycles A Comparative Study Nuclear Energy Agency Organization for Economic Cooperation and Development (NEA 2002)
- 19) M.I. Krivopustov, D. Chultem, J. Adam, V.G. Kalinnikov, A.V. Pavliouk, V.P. Perelygin, A. Polanski, A.N. Sosnin, Zh. Sereter, O.S. Zaveriouxha, Ts. Tumendelger, Sh. Gerbish, Zh. Ganzorig, P.S. Kaznovski, S.P. Kasnovski, S.G. Lobanov, V.F.

- Mischenkov, B.I. Fonarev, Yu.L. Shapovalov, R. Odoj, S.E. Chigrinov, A.M. Khilmanovich, M.K. Kievits, S.V. Korneev, E.M. Lomonosova, A. Martsinkevich, I.V. Zhuk, E.-J. Langrock, A.V. Voronkov, R. Brandt, H. Robotham, P. Vater, W. Westmeier, **M. Bielewicz**, M. Shuta, Z. Strugalski, A.Vojcechowski, A. Kugler, V. Wagner, .S.R. Hashemi-Nezhad, M. Zamani-Valasiadou, J. Adloff, M. Debeauvais. K.K. Dwivedi. **First Experiments with a Large Uranium Blanket Within the Installation “Energy plus Transmutation” exposed to 1.5 GeV Protons. Journal Kerntechnik 68/1-2 (2003) p.48-55**
- 20) M.I. Krivopustov, J. Adam, A.R. Balabekyan, Yu.A. Batusov, **M. Bielewicz**, R. Brandt, P. Caloun, D. Chultem, A.F. Elishev, M. Fragopoulou, S.R. Hashemi-Nezhad, V. Henzl, D. Henzlova, V.G. Kalinnikov, M.K. Kievets, A. Krása, F. Křížek, A. Kugler, M. Manolopoulou, I.I. Mariin, R. Odoj, A.V. Pavlyuk, V.S. Pronskikh, H. Robotham, K. Siemon, M. Szuta, V.I. Stegailov, A.A. Solnyshkin, A.N. Sosnin, S. Stoulos, V.M. Tsoupko-Sitnikov, Ts. Tumendelger, A. Wojecechowski, V. Wagner, W. Westmeier, M. Zamani-Valasiadou, O.S. Zaveryukha, I.V. Zhuk. **Investigation of Neutron Spectra and Transmutation Studies of  $I^{129}$ ,  $Np^{237}$  and Other Nuclides with 1.5 GeV Protons from the Nuclotron. JINR Preprint E1-2004-79, Dubna, Russia (2004)**
- 21) M.I. Krivopustov, D. Chultem, **M. Bielewicz** et al. On a First Experiment on the Calorimetry of an Uranium Blanket Using the Model of the U/Pb Electro-Nuclear Assembly “Energy plus Transmutation” on a 1.5 GeV Proton Beam from the Dubna Synchrotron. JINR - Preprint P1 – 2000 – 168, Dubna, 2000 (po rosyjsku)
- 22) B.A. Marcynevich, A.M. Khilmanovich, S.V. Korneev, I.L. Rakhnov, S.E. Chigrinov, M.I. Krivopustov, A.N. Sosnin, D. Chultem, Ts. Tumendelger, A.V. Pavlyuk, O.S. Zaveryukha. Unfolding of Fast Neutron Spectra in the Wide Energy Range (up to 200 MeV) in a Heterogeneous Subcritical Assembly of an Electronuclear system “Energy plus Transmutation”. JINR - Preprint R1-2002-65, Dubna, Russia (2002) and: Vesti NAN Belarus (Series Physics and Mathematics), Minsk, 1 (2004) 90 (po rosyjsku)
- 23) D. Chultem, Ts. Tumendelger M.I. Krivopustov Uranium Fission Track Integrator for Measurement of Energy Production in the Subcritical Uranium Blanket of Electronuclear Assembly. JINR – Preprint P1-2001-128 (po rosyjsku)
- 24) I.V. Zhuk, M.K. Kievets, M.I. Krivopustov, A.N. Sosnin, D. Chultem, W. Westmeier, H. Robotham, R. Brandt, Ts. Tumendelger, A.V. Pavlyuk, O.S. Zaveryukha. Investigation of Space and Energy Distribution of Neutrons in the Lead Target and the Uranium Blanket of the Electronuclear Installation “Energy plus Transmutation” During Irradiation with Proton at 1.5 GeV. JINR-Preprint R1-2002-84, Dubna, Russia (2002) and: Vesti NAN Belarus (Series Physics and Mathematics), Minsk. 12 (2003) 31
- 25) I.V. Zhuk et al. Investigation of Neutron Generation in the Uranium-Lead Assembly of Electronuclear setup “Energy plus Transmutation” bombarded by deuterons with energy 2.52 GeV. In Proceeding XVIII International Baldin Seminar on High Energy Physics Problems. Relativistic Nuclear Physics and Quantum Chromodynamics (25-30 September, 2006, Dubna, Russia). Dubna, Vol. I (2008) p.214-221
- 26) M.I. Krivopustov, **M. Bielewicz** et al. About the First Experiment on Investigation of  $^{129}I$ ,  $^{237}Np$ ,  $^{238}Pu$  and  $^{239}Pu$  Transmutation at the Nuclotron 2.52 GeV Deuterons Beam in Neutron Field Generated in U/Pb-assembly “Energy plus Transmutation”. JINR-Preprint E1-2007-7, Dubna, Russia
- 27) M. Manolopoulou, M. Fragopoulou, S. Stoulos, C. Koukoravaa, A. Spyroub, G. Perdikakis, S.R. Hashemi-Nezhad, M. Zamania Studies on the response of  $^3He$  and

- 4He proportional counters to monoenergetic fast neutrons Nuclear Instruments and Methods in Physics Research A 562 (2006) 371–379
- 28) M. Zamani, M. Fragopoulou, M. Manolopoulou, S. Stoulos, A. Spyrou, M. Debeauvais, R. Brandt, W. Westmeier, M.I. Krivopustov, A.N. Sosnin. Spallation neutron production in the new Dubna transmutation assembly. Nucl. Instr. and Meth. in Phys. Res. A504 (2003), 454
- 29) A. Krasa, F. Krizek, V. Wagner et al. Neutron Production in Spallation Reactions of 0.9 and 1.5 GeV Protons on a Thick Lead Target. Comparison Between Experimental data and Monte-Carlo Simulations. JINR Preprint E1-2005-46, Dubna, Russia (2005)
- 30) F. Krizek, V. Wagner, J. Adam, P. Chaloun, V. Henzl, D. Henzlova, A. Krasa, A. Kugler, M. Majerle, M.I. Krivopustov, V.I. Stegailov, V.M. Tsoupko-Sitnikov. The Study of Spallation Reactions, Neutron Production, and Transport in a Thick Lead Target and a Uranium Blanket During 1.5 GeV Proton Irradiation. Czech. Journal of Physics. 56 (2006) 243
- 31) O. Svoboda et al. Setup Consisting of a Pb/U Assembly Irradiated by 2.52 GeV Deuterons. In Proceeding XVIII International Baldin Seminar on High Energy Physics Problems. Relativistic Nuclear Physics and Quantum Chromodynamics (25-30 September, 2006, Dubna, Russia). Dubna, Vol. I (2008) p.222-227
- 32) O. Svoboda et al. Measurements of Cross-Sections of the Neutron Threshold Reactions and their Usage in High Energy Neutron Measurements at “Energy plus Transmutation”. Proceedings of XIX International Baldin Seminar on High Energy Physics Problems (29 Sep – 4 Oct, 2008) Dubna 2008 Vol. II p.136
- 33) G. Audi et al. The NUBASE Evaluation of Nuclear and Decay Properties. Nucl. Phys A. 1997.V.624.P.1-124
- 34) R. B. Firestone Table of Isotopes. 8-th Edition. 1998
- 35) J. Frána. Program DEIMOS 32 for Gamma Ray Spectra Evaluation. J. Radioanal. and Nucl. Chem. 257 (2003) 583
- 36) Chemia <http://www.node81.tsi.net.pl/chemia/>
- 37) Wikipedia <http://pl.wikipedia.org>
- 38) Chemia <http://chemia118.webpark.pl>
- 39) J. Banaigs, J. Berger, J. Duflo, L. Goldzahl, O. Harff, M. Cottureau, F. Lefebvres, H. Quéchon, P. Tardy-Joubert. Determination de l'intensité d'un faisceau de neutrons extrait d'un synchrotron et mesure des sections efficaces des réactions  $^{12}\text{C}(d,p2n)^{11}\text{C}$  et  $^{27}\text{Al}(d,3p2n)^{24}\text{Na}$  à 2.33 GeV. Nucl. Instr. and Meth. A95 (1971) 307
- 40) W. Westmaier et al. Transmutation Research Using the Nuclotron. In Proceeding XVI International Baldin Seminar on High Energy Physics Problems. Relativistic Nuclear Physics and Quantum Chromodynamics (10 - 15 June, 2002, Dubna, Russia). Dubna, Vol. II (2002) p.209
- 41) **M. Bielewicz** Instrukcja obróbki danych z widm gamma *Raport B, B/2002, IAE, 2002.*
- 42) De Corte F., The  $k_0$ -standardization method, Rijksuniversitat Gent 1987
- 43) Samoabsorbicja <http://physics.nist.gov/PhysRefData/XrayMassCoef/cover.html>
- 44) **M. Bielewicz**, M. Szuta, A. Wojciechowski, E. Gola-Strugalska, M.I. Krivopustov, J. Adam, A. Kugler, V. Wagner, A. Krasa, M. Majerle, P. Chaloun. On the Experiment of Neutron Spectrum Investigation on U/Pb-Assembly Using 0.7 GeV Proton Beam from the Nuclotron (Dubna). In Proceeding XVII International Baldin Seminar on High Energy Physics Problems. Relativistic Nuclear Physics and Quantum Chromodynamics (27 September - 2 October, 2004, Dubna, Russia). Dubna, Vol. II (2005) 125

- 45) A.D. Kovalenko, A.M. Baldin, A.I. Malakhov. Status of the Nuclotron. Proceedings EPAC-94, (June 1994, London), Vol. 1 (1995), 161 and: Cryogenic system of the Nuclotron – a new superconducting synchrotron. Advances Cryogenic Engineering. 39 (1994), 501 and: Main Results and Development Plans. “Atomic Energy”.(in Russian) 93 (2002) 479
- 46) A.D. Kovalenko Nuclotron: First Beams and Experiments at the Superconducting Synchrotron in Dubna. <http://lhe.jinr.ru/english/nuclotron/nuclotron.html>
- 47) A.D. Kovalenko et al. The Nuclotron - New Superconducting Ion Synchrotron at JINR. COSPAR Colloquium Dubna 2003 ; Nuclotron: Main results and Development Plans. Journal Atomic Energy, 2002, V.93, p.479-485
- 48) **M. Bielewicz**, S.Kilim, E. Gola-Strugalska M. Szuta, A. Wojciechowski, M.I. Krivopustov, A.D. Kovalenko, J. Adam, V. Wagner A. Krasa, A. Kugler, M. Majerle, Experiments of High Energy Neutron Spectrum Investigation on U/Pb – Assembly Using 1.60 and 2.52 GeV Deuteron Beam from JINR Nuclotron (Dubna). Proceedings of XIX International Baldin Seminar on High Energy Physics Problems (29 Sep – 4 Oct , 2008) Dubna 2008 Vol.II p.339
- 49) **M. Bielewicz**, S.Kilim, E. Gola-Strugalska M. Szuta, A. Wojciechowski, M.I. Krivopustov, A.V. Pavlyuk, J. Adam, A. Krasa, A. Kugler, M. Majerle, V. Wagner, On Results of Y-89 irradiation with deuteron beam on U/Pb-Assembly “Energy plus Transmutation” Using Nuclotron (JINR, Dubna). In Proceeding XVIII International Baldin Seminar on High Energy Physics Problems. Relativistic Nuclear Physics and Quantum Chromodynamics (25-30 September , 2006, Dubna, Russia). Dubna, Vol. I (2008) p.205-213
- 50) M. Majerle et al. MCMPX Simulations of the “Energy plus Transmutation” System: Nuclear Track Detectors. In Proceeding XVIII International Baldin Seminar on High Energy Physics Problems. Relativistic Nuclear Physics and Quantum Chromodynamics (25-30 September , 2006, Dubna, Russia). Dubna, Vol. I (2008) p.234-239
- 51) D. Ridikas, W. Mittag N.I.M. A418(1998) 449
- 52) L.W. Hendricks, G.W. McKinney, L.S. Waters.. MCNPX, VERSION 2.5.e, Report No. LA-UR-04-0569, Los Alamos National Laboratory, USA, February 2004
- 53) J. Janczyszyn An activation method of fast neutron excitation function determination. IFTJ AGH raport INT 190/I
- 54) TALYS code: Koning A. J., Hilaire S., Duijvestijn M. C.: Comprehensive Nuclear Reaction Modeling, Intern.Conf. on NDST, Santa Fe, USA, 26th Sept.-1st Oct 2004. AIP Conf. Proc. Volume 769 (2005) 1154-9; <http://www.talys.eu>
- 55) M. Majerle TALYS Calculation <http://ojs.ujf.cas.cz/~mitja/download/poland>
- 56) V. Wagner Spatial Distribution of Neutrons in the Pb/U Assembly Irradiated by Relativistic Protons – Systematic of Experimental Results In Proceeding XVIII International Baldin Seminar on High Energy Physics Problems. Relativistic Nuclear Physics and Quantum Chromodynamics (25-30 September , 2006, Dubna, Russia). Dubna, Vol. I (2008)
- 57) A. Wojciechowski et al. Comparison of experimental data and calculation results for Kwinta experiment of E&T RAW collaboration (December, 2011). Scientific Report 2010-2011, JINR, Dubna 2011
- 58) M.I.Krivopustov, **M.Bielewicz** et al. **First results studying the transmutation of  $^{129}\text{I}$ ,  $^{237}\text{Np}$ ,  $^{238}\text{Pu}$ , and  $^{239}\text{Pu}$  in the irradiation of an extended  $^{nat}\text{U/Pb}$ -assembly with 2.52 GeV deuterons. Journal of Radioanalytical and Nuclear Chemistry, Vol. 279, No.2,(2009) 567-584**

- 59) M. Bielewicz et al. Yttrium as a Threshold Detector for Fast Neutron Energy Spectrum (>10MeV) Measurement, J. Korean Phys. Soc. Vol.59 No 2 p.2014, (2011)
- 60) M. Bielewicz et al. Measurements of High Energy Neutron Spectrum (>10MeV) by Using Yttrium Threshold Foils in the U/Pb Assembly, Nuclear Data Sheets 119 (2014) 296–298

## Spis i wyjaśnienie niektórych skrótów użytych w tekście

- |            |  |
|------------|--|
| 1. 3D      | (Three-Dimensional) Trójwymiarowy  |
| 2. ADS     | (Accelerator Driven System) Reaktory jądrowe sterowane wiązką z akceleratora                                   |
| 3. DEIMOS  | Nazwa czeskiego programu do obróbki widm gamma.  |
| 4. DIAMEX  | Proces wydzielający Am+Cm i Ln z wypalonego paliwa   |
| 5. E+T     | (Energia plus Transmutation) Nazwa naszego projektu badawczego i modelu w nim użytego                          |
| 6. ENDF    | (Evaluated Nuclear Data File) Jądrowa baza danych wyznaczonych obliczeniowo                                    |
| 7. EXFOR   | (Experimental Nuclear Reaction Data) Baza danych eksperymentalnych dot. Reakcji jądrowych                      |
| 8. HLW     | (High Level Waste) Najgroźniejsze odpady promieniotwórcze  |
| 9. LSD     | (Leakage with Slowing Down) Technika spowalniania neutronów dla transmutacji aktynowców                        |
| 10. LWR    | (Low Pressure Water Reactor) Reaktor jądrowy chłodzony wodą o niskim ciśnieniu                                 |
| 11. MCNPX  | (Monte Carlo radiation transport code) Kod komputerowy do symulacji oddziaływania promieniowania z materią     |
| 12. NUBASE | (Nuclear Structure and Decay Data) Baza danych   |
| 13. ORTEC  | (Oak Ridge Technology) Nazwa koncernu przemysłowego  |
| 14. SSNTD  | (Solid State Nuclear Track Detektor) Detektory śladowe wykorzystujące folie lub klisze lub inny stały materiał |
| 15. TALYS  | Kod komputerowy do symulacji reakcji jądrowych   |
| 16. TRU    | (Transuranic) Transuranowce  |
| 17. U-Pb   | (Uranium-Plumbum) Uranowo ołowiowy   |