NEUTRON INDUCED FISSION STUDIES AT NCSR "DEMOKRITOS" BY THE NTUA

V. MICHALOPOULOU
National Technical University of Athens, Zografou/Athens, Greece

Fission is one of the most challenging and not well-known phenomena in nuclear physics and, at present, an ab initio theory able to predict fission cross sections as well as the characteristics of the fission process does not exist. The theoretical investigation of the cross section for the fission channel is mainly based on phenomenological analyses with parameters that need to be tuned in order to reproduce the experimental data. Thus, highly accurate data are needed for the testing of the existing nuclear models and consequently for the improvement of their predictive power. Furthermore, the development of the new generation of nuclear reactor technology, which aims at safer and cleaner energy production, requires highly accurate cross-sectional data of all the neutron-induced reactions mainly on minor actinides.

The neutron beam facility of the 5.5 MV Tandem T11/25 Accelerator Laboratory of the NCSR "Demokritos" has been extensively used over the past 10 years for fission cross section measurements on various actinides (^{237}Np, ^{234}U, ^{236}U, ^{232}Th), at and above the fission threshold [1-7]. All these isotopes are very important for the design of advanced nuclear systems for a more clean and safe future energy production as well as for the dissemination of nuclear waste. The neutron beam is produced via the ^{7}Li(p, n), the ^{3}H(p,n), the ^{2}H(d,n) and the ^{3}H(p,n) reactions, depending on the energy range of interest. The neutron flux (of typically 10^5-10^6 n/cm^{2}s) is calculated by means of the reference ^{235}U(n,f) and ^{238}U(n,f) cross sections. Special attention is given to the study of the neutron beam (monochromaticity, propagation of neutron beam among the targets etc.), due to the lack of effective threshold for the fission cross section, via detailed Monte Carlo simulations and experimental checks. The detection system consists of a stack of ionization gas cells based on the Micromegas Microbulk technology [8] for the detection of the fission fragments (FF). The mass and homogeneity of the actinide targets used are characterized by means of alpha spectroscopy and Rutherford Backscattering spectrometry, respectively.

The final experimental points, which are made publicly available at the scientific community via the EXFOR database, have low uncertainties of the order of 5%.

An overview of the experimental campaign, the description of the setup and the analysis as well as the future perspectives will be presented and discussed.

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