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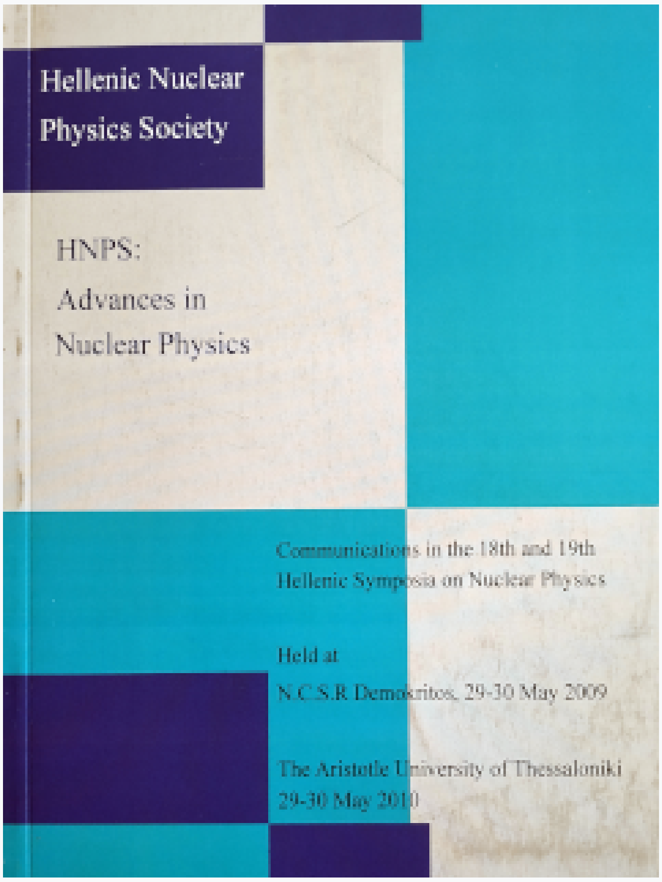

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^{128}Xe Lifetime Measurement Using the Coulex-Plunger Technique in Inverse Kinematics

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Abstract

The lifetimes of the lowest collective yrast and non-yrast states in ^{128}Xe were measured in a Coulomb excitation experiment using the recoil distance method (RDM) in inverse kinematics. Hereby, the Cologne plunger apparatus was employed together with the JUROGAM spectrometer. Excited states in ^{128}Xe were populated via projectile Coulomb excitation in inverse kinematics, i.e. by using a ^{128}Xe beam impinging on a ^{nat}Fe target at E (^{128}Xe) $\sim$ 525 MeV. Recoils were detected by means of an array of solar cells placed at forward angles. Recoil-gated -spectra were measured at different plunger distances.

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‘Study of the d+^{11}B system differential cross sections for NRA purposes’

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The accurate quantitative determination and depth profiling of the element boron is nowadays of extreme importance in many technological applications (semiconductor technology, plasma technology etc) and environmental research activities. However, as boron is usually present in heavy matrices along with other light elements its determination has been a challenge for all Ion Beam Analysis (IBA) techniques.
Nuclear Reaction Analysis (NRA) is well established nowadays as one of the principal IBA techniques, due to its advantages: high isotopic selectivity and capability of least destructive depth profiling. Specially when deuterium is the probing beam (d-NRA) critical advantages emerge, such as a) the possibility for simultaneous activation, and thus analysis, of all the light elements that usually coexist in samples (e.g. C, O, B, N etc), b) the enhanced sensitivity and accuracy (due to the large cross sections of the deuteron induced reactions), c) the low beam energy required and d) the low energy loss in the material, compared to the ^{3,4}He. In order for d-NRA to be used in the determination of boron, the absolute values of the cross sections of the reactions of the deuterium with boron are necessary. These values cannot be theoretically predicted for light nuclei, such as boron, and have to be determined experimentally. However a lack of such experimental data has been pointed out for the d+^{11}B system, despite the fact that ^{11}B is the main constituent isotope of natural boron (80%) and the high Q-value of the reaction ^{11}B(d,α_0) (8031.2 keV).
Therefore, the present work aims to contribute to the field of boron profiling, through the determination of the absolute differential cross sections of the reactions ^{11}B(d,p) and ^{11}B(d,α), using a deuteron beam of energy 900-1200keV in the lab system (step: 25keV), at detection angles 140^o-170^o (step:10^o). The experiment took place at the I.N.P.R of the N.C.S.R ‘Demokritos’, by using the 5.5 MV TN11 Van de Graaff TanDem accelerator. The values of the differential cross sections are validated through a benchmarking experiment, using a high purity thick B_4C target, and are already available to the scientific community for application through IBANDL (www-nds.iaea.org/ibandl/). The experimental procedure, the data analysis and the results, as well as the comparison of d-NRA with other techniques (including IBA) in the determination of boron were presented and discussed, and more details can be found in the published paper: M. Kokkoris, M. Diakaki, P. Misaelides, X. Aslanoglou, A. Lagoyannis, C. Raepsaet, V. Foteinou, S. Harissopulos, R. Vlastou, C.T. Papadopoulos, *Nuclear Instruments and Methods in Physics Research B* ***267*** *(2009) 1740–1743.*