Search for shape coexistence in the Selenium isotopes near the N=50 neutron shell closure*

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In this contribution we discuss the investigation of the shape coexistence phenomenon in neutron-rich Selenium (Z=34) isotopes (83Se and 84Se), near the N=50 neutron shell closure, by gamma-ray spectroscopy. The shape coexistence phenomenon consists in the appearance of different shapes (spherical, oblate and prolate) within the same nucleus at comparable excitation energies [1]. The 84Se (N=50) and 83Se (N=49) nuclei have been populated by a sub-Coulomb barrier transfer reaction at IFIN-HH (Bucharest) and by a neutron capture reaction at ILL (Grenoble), respectively. The gamma decay of 84Se was detected by the HPGe ROSPHERE array coupled with the SORCERER Silicon detector array. Two excited 0+ states, already known from literature [2], [3], have been confirmed at 2244 keV and 2654 keV excitation energy, and their gamma decay to the first 2+ state has been observed for the first time. Preliminary results from lifetime analyses, indicate that the lifetime of the third 0+ is of the order of 3 ps, while a longer lifetime is expected for the second excited 0+ state. The analysis is currently ongoing. In the case of 83Se, the gamma decay was detected by the HPGe FIPPS array. Prior to the present (n, γ) measurement, very little information was available from the literature, with only 11 primary gamma rays placed in a tentative level scheme [4]. The current gamma-spectroscopy data allowed to significantly expand the decay scheme of 83Se, through the observation of 28 new primary gammas, 89 new transitions and 16 new populated energy levels. The data analysis is still ongoing and firm spin and parity assignments of newly found states will be obtained from angular correlation investigation. For both nuclei, comparison with theoretical predictions from Monte Carlo Shell Model calculations will be made in order to achieve a microscopic description of their structure.

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