High-spin structure of neutron-rich nuclei produced by heavy-ion induced fission

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Using the Euroball4 array at Strasbourg, we have recently performed several experiments devoted to the study of high-spin states of nuclei with A $\sim$ 80 - 130, produced from fission following the fusion reactions, ^{30}Si + ^{176}Yb at 145 MeV bombarding energy, ^{31}P + ^{176}Yb at 152 MeV and ^{18}O + ^{208}Pb at 85 MeV. In such experiments, each fission fragment can be identified from the γ-ray cascades deexciting its excited states. Moreover, from γ-ray coincidences measured between transitions in complementary fragments, γ-rays deexciting new high-spin states of hitherto unexplored isotopes can be assigned.

From these experiments and previous ones performed with Eurogam2 at Strasbourg [1-5] and Euroball3 at Legnaro [6], level schemes of many stable and neutron-rich nuclei have been extended or newly established up to, in some cases, spin 18 $\hbar$ and excitation energy 8 MeV.

We will present the new experimental results obtained in some neutron-rich odd-Z nuclei from $_{41}$Nb to $_{53}$I. All the band-head configurations have been identified from the behaviour of the collective bands built on them. Therefore the single-proton states, located around the Fermi levels for Z = 41 to 53, can be discussed as a function of the neutron number (and the deformation). In all these isotopic series, three-quasiparticle states have been measured above 2 MeV excitation energy. The case of $_{49}$In nuclei [7] will be discussed in the framework of shell-model calculations.

Futhermore the individual identification of each fragment by means of its emitted γ transitions allows us to have a new insight into the mechanism of fission induced by heavy ions. The last results will be reported.

References:

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