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Study of the transition from single-particle to collective behaviour in Po isotopes

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Single-particle motion and nuclear collectivity are the two extremes which have shaped our understanding of the dynamics for the nuclear many-body system. A suitable region for studying the evolution of the nuclear states with the number of valence nucleons from single-particle configurations towards multiconfigurational mixture are the neutron-deficient Po isotopes in the vicinity of the doubly-magic nucleus ^{208}Pb. To fill the gap in the evolution between the states of seniority-type character in ^{210}Po [1] and those of collective nature in ^{204}Po [2], we have studied the low-lying states of the even-even ^{206,208}Po isotopes as well as the low-lying negative-parity states of ^{209}Po. The results for the low-lying negative-parity states of ^{209}Po show that the removal of one neutron from ^{210}Po does not induce any additional quadrupole collectivity. If we remove further neutrons from the closed shell, the experimental results indicate that in Po isotopes the transition from single-particle to collective excitations has a pronounced spin-dependent behaviour. The nature of the 6_1^+ and 8_1^+ states remains of the seniority-type regime and the transition to collectivity occurs at N$\leq$120 since the structures of the 4_1^+ and 2_1^+ states of Po isotopes have already collective nature below N=124. In the present study will be summarized results from our previous studies for ^{208}Po [3] and ^{209}Po [4] as well as new results for the $B(E2; 2_1^+ \rightarrow 0_1^+)$ of ^{206}Po will be presented.

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