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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 $^{206,208}\text{Po}$ 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.

1. D. Kocheva et. al., Eur. Phys. J. A 53, 175 (2017).
2. M. Stoyanova, et. al., Phys. Rev. C 10, 064304 (2019).
3. D. Kalaydjieva et. al., Phys. Rev. C 104, 024311 (2021).
4. V. Karayonchev et. al., Phys. Rev. C 103, 044309 (2021).

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