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First trap-assisted decay spectroscopy of the ^{81}Ge ground state

The ^{78}Ni ($Z = 28$, $N = 50$) region has been one of the main focus points in nuclear structure studies during the last decades. The recently measured 2_1^+ excitation energy of ^{78}Ni $E_x(2_1^+) = 2.6$ MeV has been interpreted as the proof of its doubly magic nature. Despite this remarkable result, the nuclear structure in the region is far from fully understood. Shape coexistence phenomena observed in the $N = 40$ region seems to extend to the $N = 50$ region and result in a new island of inversion. Coexisting shapes can also lead to isomeric states which complicate the studies of these nuclei.

In this work, we re-investigate the ^{81}As level scheme populated in the decay of ^{81}Ge in a systematic attempt to improve spectroscopy knowledge in the region of suspected shape coexistence. Up to now, the β-decay studies of the $N = 49$ isotones for $Z \leq 32$ have not been performed with an unambiguous ground state and isomer separation. In this work, we have utilized the JYFLTRAP Penning trap at IGISOL, Jyväskylä and selected the $(9/2^+)$ ground state of ^{81}Ge ($Z = 32$) for detailed studies at a post-trap decay spectroscopy setup. This is a clear improvement compared to the previous spectroscopy study of the decay of ^{81}Ge \cite{Hoff81} which utilized a mass-separated $A = 81$ beam consisting mainly of ^{81}Ga.

The intrinsic half-life of the ^{81}Ge ground state has been determined as $T_{1/2} = 6.4(2)$ s, which is significantly shorter than the literature value. A new level scheme of ^{81}As has been built and is compared to shell-model calculations.

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