

Results from $d(^{30}\text{Mg}, p)^{31}\text{Mg}$ at REX-ISOLDE

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In a β -NMR experiment at REX-ISOLDE the ground state of ^{31}Mg , located right at the edge of the “island of inversion” was determined to be a $1/2^+$ state [1]. In the only theoretical calculation that yielded the same spin and parity for the ground state this state contains more than 90 % intruder configuration [2]. This calculation makes predictions for the excited states in ^{31}Mg , concerning spins, parities and configurations that can be tested using transfer reactions.

In order to start a transfer reaction program in inverse kinematics at REX-ISOLDE with the gamma-spectrometer MINIBALL a new setup (T-REX [3]) was built, covering a large solid angle for light charged particles using silicon ΔE -E telescopes. In the first T-REX experiment the reaction $d(^{30}\text{Mg}, p)^{31}\text{Mg}$ was studied to obtain information on the excited states of ^{31}Mg . The analysis of the shape of the angular distribution of protons from the reaction populating the second excited state at 221 keV allowed the determination of the transferred angular momentum and provided for the first time a direct measurement of the parity of this $3/2^-$ state. Comparison of total $1n$ transfer cross sections with DWBA calculations for $\Delta L = 0, 1, 2$ allowed for the extraction of the cross sections for the ground and first excited state as well.

The cross section of the second excited state is found to be a factor four lower compared to the DWBA calculations than the cross sections of the two other states. Comparison to Nilsson model calculations indicates a possible shape co-existence of an oblate deformed second excited state and prolate deformed ground and first excited state.

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References

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