Low-Level Structure of ^{52}Ti Based on g Factor and Lifetime Measurements ◇

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The g factors and the lifetimes of the 2_1^+ and 4_1^+ states in radioactive ^{52}Ti ($T_{1/2}$ = 1.7 m) have been measured for the first time using the technique of transient magnetic fields and the Doppler-Shift-Attenuation method, respectively. The excited states (Fig. 1) were populated in the α-transfer reaction to a ^{48}Ca beam of 100 MeV in collisions with carbon of a multilayered target.

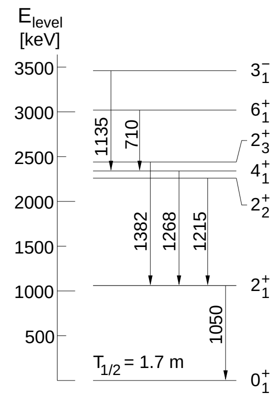

Fig. 1: Level scheme of ^{52}Ti with γ transitions relevant to the present work.

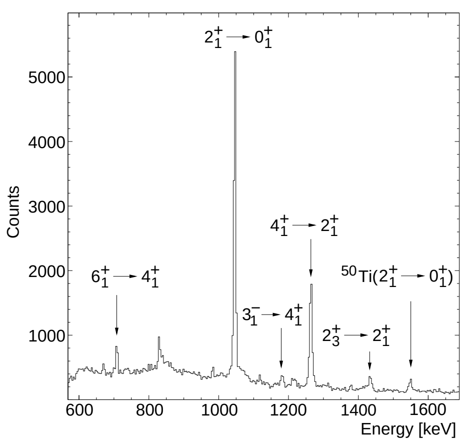

Fig. 2: Ge γ-coincidence spectrum. The spin assignments of the γ transitions refer to the level scheme of Fig. 1.

Intense beams of highly enriched ^{48}Ca were provided by the Cologne tandem accelerator. Spin precessions of the states in question were experienced in ferromagnetic Gd whereby the nuclear excited ions were ultimately stopped in the Cu backing. De-excitation γ rays were measured in coincidence with the forward emitted α particles from the decay of ^{8}Be registered in a Si detector at 0° which was shielded against the beam ions by a Ta stopper foil. A Ge γ-coincidence spectrum is shown in Fig. 2. The g factors, $g(2_1^+) = +0.83(19)$ and $g(4_1^+) = +0.46(15)$, and the B($E2$) values deduced from the measured lifetimes, $\tau(2_1^+)$ = 5.2(2) ps and $\tau(4_1^+)$ = 4.8(6) ps, have been interpreted in the framework of fp shell model calculations using the most commonly applied effective NN interactions. The two measured g factors were accounted for by none of the calculations except for the FPD6 interaction [1] with modified single-particle energies. The new data were also discussed in relation to the neighbouring isotopes , ^{48,50}Ti, the isotones, ^{50,52,54}Cr, and the magic N = 28 shell closure. The new calculations generally reproduce quite well the trends of the data in terms of their dependence on neutron number (Fig. 3). More details of this work are reported in [2].

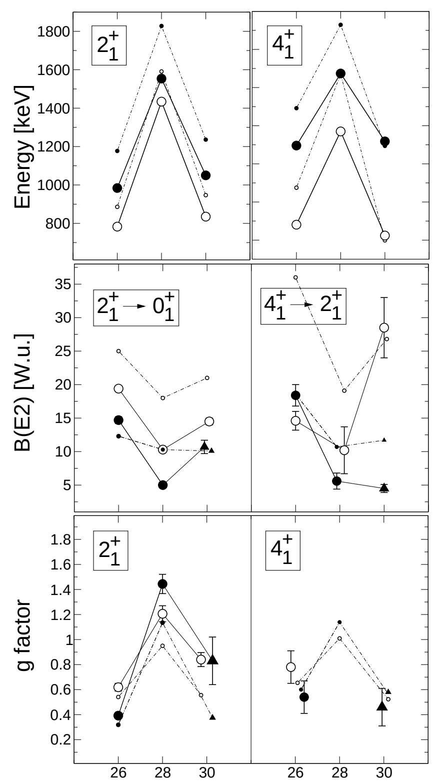

Fig. 3: Experimental excitation energies, B($E2$)'s and g factors of 2_1^+ and 4_1^+ states of Cr(open circles)- and Ti(closed circles)-isotopes are compared with results from shell model calculations using FPD6 as the effective interaction.

References

[1] W.A. Richter *et al.*, Nucl. Phys. **A 253** (1991) 325
[2] K.-H. Speidel *et al.*, Phys. Lett. **B 633** (2006) 219

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