THE B(E2) VALUE OF THE $3/2^- \rightarrow 7/2^-$ 1381 keV TRANSITION IN ^{49}Ti

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ABSTRACT

The B(E2)↓ value of the 1381 keV transition connecting the $J = 3/2^-$ first excited state to the $J = 7/2^-$ ground state in ^{49}Ti has been determined by means of Coulomb excitation measurements. The value obtained is $B(E2)\downarrow = (33.5 \pm 4.5)\ e^2 fm^4$

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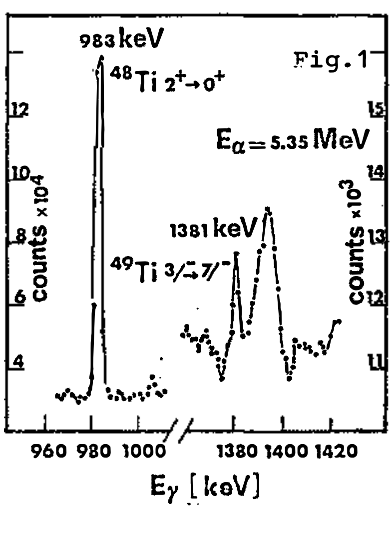
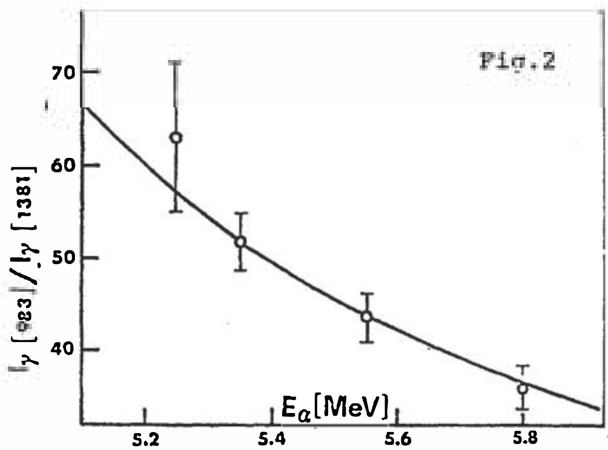
The measurement of the strength of the 1381 keV $3/2^- \rightarrow 7/2^-$ transition in ^{49}Ti appears rather interesting since the corresponding transitions in the isotones $^{51}_{24}Cr_{27}$ and $^{53}_{26}Fe_{27}$ are strongly retarded [1,2,3]. Their high hindrance factors have been the starting point for an interesting interpretation of the low-lying levels of the latter nuclei in terms of $K = 1/2^-$ and $K = 7/2^-$ rotational bands[3,4]. We have determined the B(E2)↓ value of the transition in ^{49}Ti by means of Coulomb excitation measurements, using the alpha particle beam from the CN Van de Graaff of the Laboratori Nazionali di Legnaro (Padova). The target consisted of a self-supporting metal foil containing 81.6% ^{49}Ti and 14.1% ^{48}Ti. Single γ-spectra were recorded at four different beam energies (5.25; 5.35; 5.55 and 5.8 MeV); the highest energy used is still to be considered a "safe" one to avoid nuclear effects (distance of closest approach equal to 11.8 fm; sum of nuclear radii, with $r_o = 1.2$ fm, equal to 8.65 fm). γ-rays were detected on a coaxial Ge(Li) detector placed at 90° to the beam direction. The B(E2)↓ value for the transition in ^{49}Ti was determined relative to the B(E2)↓ value of the 983 keV $2^+ \rightarrow 0^+$ transition in ^{48}Ti. Fig. 1 shows the relevant parts of the spectrum taken at 5.35 MeV beam energy.



In Fig. 2 we report the ratio of the observed intensities for the 983 keV



and 1381 keV γ-rays together with a best fitted theoretical curve obtained from standard Coulomb - excitation calculations. Errors shown are purely statistical. The deduced value for the ratio R of the B(E2)↓ in ^{49}Ti to the B(E2)↓ in ^{48}Ti comes out to be $R=(24 \pm 2.5) \cdot 10^{-2}$. The quoted error results from a 7% statistical contribution, to which we added linearly a further 4% uncertainty to take into account possible systematic errors in the background subtraction under the weak 1381 keV line. Assuming for the B(E2)↓ transition in ^{48}Ti the most precise value reported in the literature[5], our final value for the B(E2)↓ of the transition in ^{49}Ti reads

$$B(E2)\downarrow = (33.5 \pm 4.5) \cdot e^2\ fm^4$$

This value is consistent with previous experimental limits reported in the literature[6,7].

The strength of the transition amounts to about 3 Weisskopf units, indicating a different structure for the $3/2^-$ first excited state in ^{49}Ti with respect to the ^{51}Cr and ^{53}Fe cases.

REFERENCES

1) W.HAAR and F.W.RICHTER, Z.Phys. 231, 1 (1970)
2) S.COCHAVI and K.NAGATANI, Phys. Rev. C4 2083 (1971)
3) P.A.MANDO', P.SONA and N.TACCETTI, Nuovo Cim.34A, 80 (1976)
4) I.M.SZÖGHY, J.S.FORSTER and G.BALL, Nucl.Phys. A201, 433 (1973)
5) O.HAUSSER, D.PELTE, T.K.ALEXANDER and H.C.EVANS, Nucl.Phys. A150, 417 (1970)
6) O.F.AFONIN, A.P.GRINBERG, I.K.LEMBERG and I.N.CHUGUNOV, Sov. J. Nucl.Phys. 6, 160 (1961)
7) D.C.S.WHITE, W.J.McDONALD, D.A.HUTCHEON and G.C.NEILSON, Nucl.Phys.A260, 189 (1976).