Level Scheme of ^{126}Te

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Introduction

Even mass Te nuclei in the mass region A∼130, have been subject of considerable interest because of their transnational character. In even mass Te nuclei the alignments of valance protons out side the ^{114}Sn core lying in low-Ω $h_{11/2}$ orbitals (proton Fermi surface) drive the nucleus towards prolate shape where as the aligned neutrons lying in higher -Ω $h_{11/2}$ orbitals (neutron Fermi surface) generally drive the nucleus towards oblate shape. Shape coexistence is one of the interesting characteristic feature of these nuclei.

K-isomers have also been reported in several nuclei with neutron number N∼74. Theoretically K=8^+ isomer is also expected in ^{126}Te nucleus [1]. Information on low spin states of ^{126}Te were known from the β-decay studies [2]. The band structure of ^{126}Te have been been studied via fusion reaction [3] and also via fusion induced fission spectroscopy [4]. Interestingly, placement of several γ-rays do not agree in these measurements [3, 4].

In this work, a detailed re-investigation of the low lying levels of ^{126}Te has been done via fusion evaporation reaction. For complete investigation, R_{DCO} and Polarization measurements were also carried out.

Experimental Details

In-beam γ-ray spectroscopy of ^{126}Te has been carried out using the 15UD pelletron accelerator [5, 6] at Inter University Accelerator Center, New Delhi. The high spin states in ^{126}Te have been populated via ^{124}Sn(^{7}Li, p4nγ)^{126}Te fusion-evaporation reaction at E_{beam}= 33 MeV. Fifteen Compton suppressed clover detectors of Indian National Gamma Array (INGA) [7] have been used to detect the de-exciting γ-rays. The offline data analysis has been carried out using the computer code INGAsort [8]. A number of matrices have been formed by sorting of the gain matched list mode data in order to carry out the γ-γ coincidence and angular correlation data analysis.

Results and Discussion

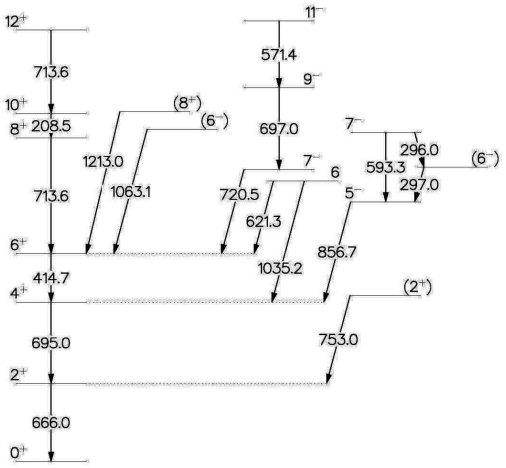

FIG. 1: Partial level scheme of ^{126}Te.

In the present study, the 208 keV and 989 keV γ-transitions of the ground state band (as marked in figure 2.) were altered with respect to their earlier position in the previously reported level scheme [3]. The present modified level scheme of ^{126}Te nucleus is shown in figure 1. The placement of these two transitions

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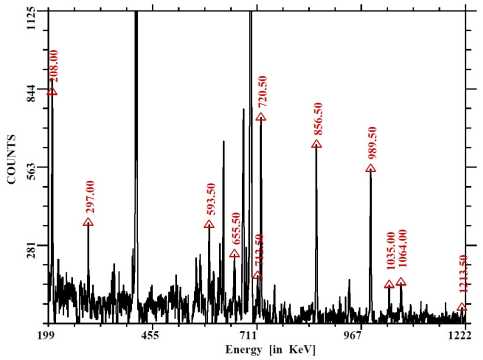

FIG. 2: Plot shows 666 keV energy gate in which important γ-rays belonging to ^{126}Te nucleus are marked with their energies.

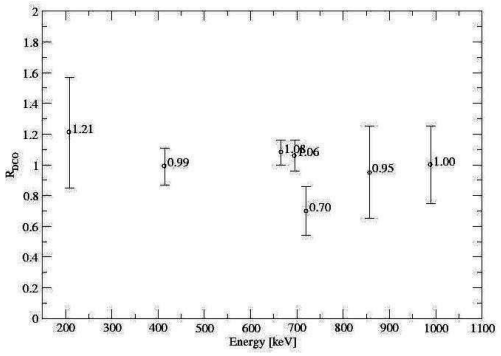

FIG. 3: Plot shows the R_{DCO} values of various γ-transitions belonging to ^{126}Te, determined from the energy gates of 666 keV and 695 keV quadrupole transitions.

was also agree with the palcement reported by Astier et al [4]. In addition to this, a 1035 keV transition was also placed above 6^+ state at 1775 keV by Pasi et al [3] . The placement of this transition also changed in present work and now placed above 4^+ state at 1361 keV in the g.s. band and corresponding energy of the new level was found to be 2396 keV. From the same 2396 keV level, another 621 keV γ-transition was also found decaying to 6^+ state at 1775 keV of the g.s. band.

The multipolarity of several γ-rays have been assigned on the basis of Directional Correlation of Oriented states (DCO) ratio, determined from angular correlation measurement.

$$R_{DCO} = \frac{I_{\gamma_1} \text{ at } \theta_1, \text{ gated by } \gamma_2 \text{ at } \theta_2}{I_{\gamma_1} \text{ at } \theta_2, \text{ gated by } \gamma_2 \text{ at } \theta_1}$$

The present R_{DCO} values as shwon in figure 3, confirm the quadrupole and dipole nature of several prominant γ-transitions and agree with earlier works [3, 4]. In order to extract the information on configurations of the observed band structures detail analysis of the experimental data for R_{DCO} and polarisation measurement is under way.

Conclusion

The excited states of ^{126}Te were populated via ^{124}Sn(^{7}Li, p4nγ)^{126}Te fusion-evaporation reaction and few new γ-lines were identified and placed in the level scheme. Also, the position of few earlier placed γ transitions were changed in the present work. The multipolarity of several prominant γ-transitions were determined from angular correlation data (R_{DCO}) and used for spin assingment.

Acknowledgment

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