

Study of proton induced reactions on scandium at the energy 100, 160 and 200 MeV

The study of nuclear reactions on scandium is of some interest for fundamental nuclear physics, since the number of protons in this nucleus is one more than the magic number “20”. In addition, natural scandium is a monoisotope. Therefore, when it is irradiated with accelerated protons, it is easy to identify the channels of different reactions.

We have irradiated scandium targets with accelerated protons at energies of 100, 160 and 200 MeV. The irradiation was performed at the Prometheus proton therapy complex of the Physical-Technical Centre, Lebedev Physical Institute of the Russian Academy of Sciences. The irradiated targets were measured using Ortec® and Canberra® semiconductor spectrometers with ultrapure germanium detectors having an energy resolution of 1.8-2.0 keV for 1333 keV ^{60}Co gamma radiation. The detection efficiency of the spectrometers was determined using standard calibration sources ^{152}Eu , ^{226}Ra , ^{137}Cs .

Gamma transitions accompanying the decay of ^{45}Ti , ^{44}Sc , ^{43}Sc , ^{43}K , ^{42}K , ^{41}Ar , ^{39}Cl , ^{38}Cl , ^{38}S were reliably identified in the gamma spectra of the measured targets.

The table shows the cross sections of the studied reactions at a proton energy of 160 MeV. The experimental values were compared with theoretical values calculated in the framework of the constant temperature Fermi gas model [1] using the software code Talys 1.96 [3]. The results are discussed.

Table. Cross sections of the studied reactions at a proton energy of 160 MeV

References

1. A. Gilbert and A. G. W. Cameron, Can. J. Phys. (1965) <https://doi.org/10.1139/p65-139>
2. A.J. Koning and D. Rochman, Nucl. Data Sheets (2012) <https://doi.org/10.1016/j.nds.2012.11.002>

Section

Experimental and theoretical studies of nuclear reactions

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