INVESTIGATION OF RADIATION FROM Al^{26m}, S^{31}, Ti^{43}, *AND* Mn^{57}

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The β spectra of short-lived Al^{26m}, S^{31}, Ti^{43}, and Mn^{57} were investigated with a magnetic β spectrometer. The upper limit of the β spectrum of Ti^{43}, 5.5 ± 0.1 MeV, is in good agreement with the theory [4]; the half-life is 0.4 ± 0.05 sec. It is found that the Mn^{57} β spectrum consists of two partial β spectra with upper limits at 2550 ± 50 and 1100 ± 100 keV and relative intensities of 82 and 18%. A value of 4200 ± 100 keV has been obtained for the end point energy of the β spectrum of S^{31}. The end point energies and lifetimes in the other cases agree with available data within the experimental errors.

WE have continued our investigation of nuclei with short half lives, using a magnetic-lens β spectrometer and the method described earlier [1], and enriched Ti^{43}, Al^{26m}, Mn^{57}, and S^{31} targets.

Ti^{43}. The radiation of Ti^{43} was not studied in sufficient detail. Tyren and Tove [2] measured the half life of Ti^{43}, for which they obtained a value equal to 0.58 sec. The Ti^{43} was obtained by bombarding titanium with 30 MeV protons. The measurements were made with a scintillation counter. Janecke and Jung [3] investigated the β^+ spectrum of Ti^{43} with the aid of a scintillation detector; the upper limit turned out to be 5.81 ± 0.15 MeV. The upper limit of the β^+ spectrum of Ti^{43} was calculated by Baz', Gol'danskiĭ, and Zel'dovich [4] to be 5.5 MeV. They obtained a value of 0.6 second for the half life.

The same magnetic-lens β spectrometer was used to plot the β^+ spectrum of Ti^{43}. The latter was obtained from the $Ca^{40}(\alpha, n)Ti^{43}$ reaction. The target was $Ca^{40}CO_3$. The upper limit of the β^+ spectrum of Ti^{43} was found to equal 5.5 ± 0.1 MeV, in good agreement with the value obtained by Baz', Gol'danskiĭ, and Zel'dovich [4].

The Fermi plot of the β^+ spectrum of Ti^{43} turned out to a straight line starting with ~2800 keV (Fig. 1). At lower energies, the sharp deviation from linearity is due to the superposition of other β^+ spectra on the Ti^{43} β^+ spectrum.

The most appreciable contribution is from the β^+ spectrum of O^{15} produced in the $C^{12}(\alpha, n)O^{15}$ reaction. The half life of Ti^{43} was measured at a positron energy of 3271 keV and was found to be 0.4 ± 0.05 sec. The half life measured at a positron energy of 884 keV was found to be 1.5 ± 0.4 min, owing to the presence of the β^+ spectrum of O^{15}.

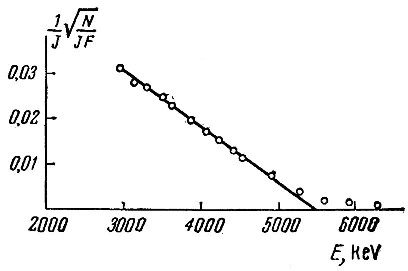

FIG. 1

Al^{26m}. During the measurements we determined also the upper limit of the β^+ spectrum of Al^{26m}, which was found to be 3230 ± 50 keV. The half life of Al^{26m} was measured at a positron energy of 2275 keV and found to be 6.5 ± 2 sec. These results agree with the data obtained by others (see [5-9]).

Mn^{57}. The Mn^{57} radiation was the subject of only a few investigations [10,11], the results of which need further verification. Figure 2 shows the plot obtained for the β^- spectrum of Mn^{57}. We see that the β^- spectrum consists of two partial spectra with upper limits 2550 ± 50 and 1100 ± 100 keV

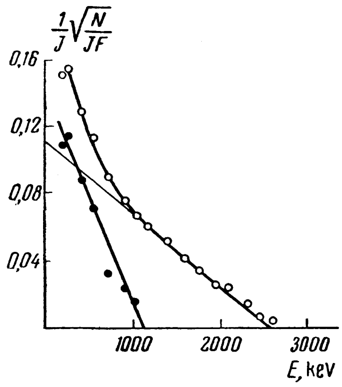

FIG. 2

and with relative intensities 82 and 18% respectively. The Mn^{57} was obtained from the $Cr^{54}(\alpha, p)Mn^{57}$ reaction. The half life was found to be 1.9 ± 0.3 min. The measurements were carried at electron energies 371 and 1190 keV.

$\underline{S^{31}}$. The S^{31} radiation was investigated by Hunt et al [12], Leĭpunskiĭ et al [13], and Wallace et al [14]. The value of the upper limit of the β^+ spectrum obtained in our investigation is 4200 ± 100 keV. The half life measured at 3271 keV is 2.75 ± 0.25 sec.

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