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NOTE ON THE DECAY OF Rb^{82}

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April 2, 1953

Berkeley, California

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The purpose of this letter is to point out certain discrepancies between previous work[1] on the decay of Rb^{82} (6.3 hour, β^+, K-capture) and studies made recently at this laboratory. The activity was produced by bombarding CuBr powder with 12-14 Mev alpha-particles. The beam energy was reduced below the (α-2n) threshold in order to eliminate Rb^{81} (4.7 hour). This was verified by the fact that the half life of the Rb activity showed only the 6.3 hour Rb^{82} and 34 day Rb^{84} components which are produced by (α, n) reactions.

Comparison of the γ-ray energy measurements is shown in Table I. In following the half-lives of the individual conversion electron lines with a β-spectrometer, the 558 kev line reported to be associated with Rb^{82} was found to exist several days after the 6.3 hour lines had completely decayed. The 423 kev line could not be resolved. Although the results of the γ-ray measurements are in good agreement, the β-ray upper energy limits as shown in Table II are completely different. The β-spectrometer used was equipped with a helical baffle which could be used to transmit either positrons or electrons. Thus, the presence of high energy conversion electrons could not cause distortions in the upper energy region of the positron spectrum. The fit of the positron spectrum to the known low energy γ-rays is shown in Figure 1. A log ft. value of 3.8 for the low energy group is not significant since the error in the energy measurement is 20 percent.

The 770 kev transition appears to be the most intense in agreement with the previous work, and it is expected to be an E2 since the transition is between the first excited and ground states of an even-even nucleus. It is

felt that the 187 kev transition is of sufficient intensity to be placed lower in the level scheme than at the uppermost level as given in Reference 1. The intensity of this line was sufficient to permit a measurement of the internal conversion coefficient. The measured value is $\alpha_k = 9.1 \pm 1.0 \times 10^{-2}$ and the theoretical value[2] of an E2 transition of this energy and Z-value is 9.3×10^{-2}.

As pointed out by the previous authors, any decay scheme with this number of lines should be considered tentative until more accurate information as to γ-ray intensities is known.

[1] C. M. Huddlestone and A. C. G. Mitchell, Phys. Rev. 88, 1350 (1952).

[2] Rose, Goertzel and Perry, Oak Ridge National Laboratory, ORNL-1023 (July 1951).

Table I

Gamma Rays of Rb^{82} (energies in kev)

Huddlestone and Mitchell			Present Work			
Photoelectrons			Photoelectrons			
Pb radiator	U radiator	Conversion Electrons	Au radiator	U radiator	Conversion Electrons	Pulse Height Analysis (NaI Crystal)
		188	187		188	195
		248	260		268	250
		322	325		320	315
388	390	390	395		390	380
423	423					
465	468	464	458		465	475
545	550	558	563*		558*	
610	610		628		623	610
690	690		695		685	685
768	770		776		780	770
	818		833		828	835
	1020	1018		1020		1030
		1314		1315		1305
	1464	1464		1460		1440

*See text

Table II

Positrons from Rb^{82}

E_{max}(kev)	Abundance (percent)	log ft
Huddlestone and Mitchell		
775	76	4.93
175	24	4.88
Present Work		
1080±10	40	5.25
890±15	38	4.95
610±20	12	4.7
300±50	10	3.8

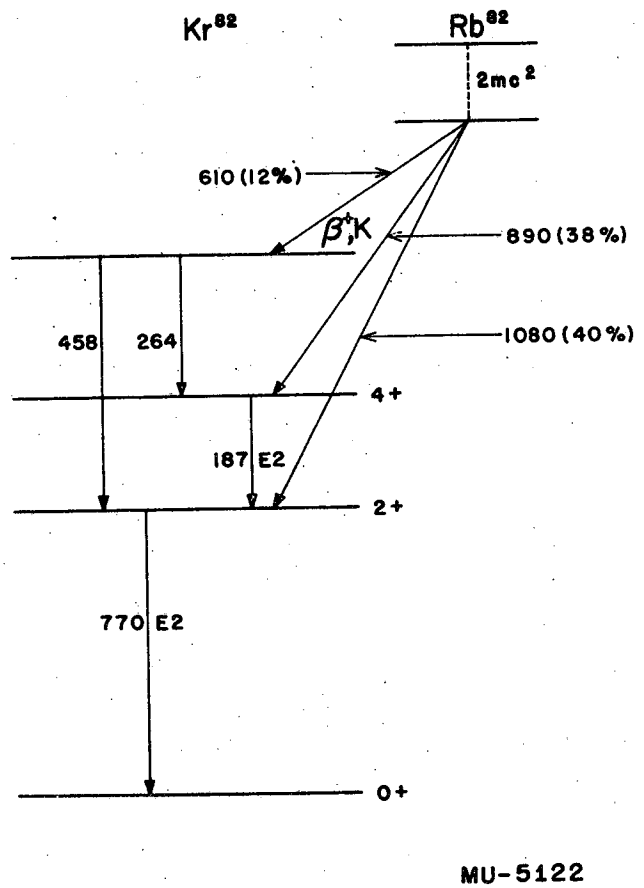

Fig. 1 Suggested low energy portion of Rb^{82} decay scheme.