energy spectrum for the solution is characterized by the value $p_0 = 0$; the effective mass of the He^3 in solution can be determined from the slope of these lines. The calculations lead to the value $\mu = 3.0\, m_3$, the effective mass depending upon neither temperature nor concentration. These results fully confirm the conclusions previously reached[8]; the value for μ given here, however, is somewhat more exact, insofar as it has been determined by averaging the data obtained for several solutions having different concentrations of He^3.

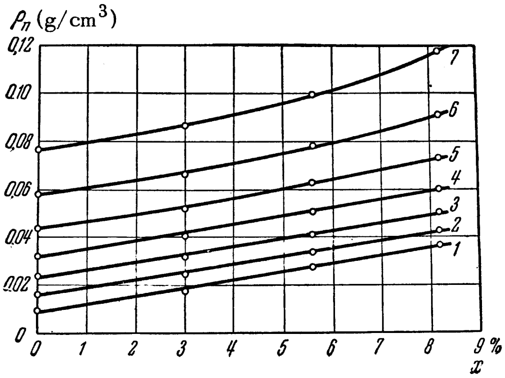

FIG. 2. Dependence of the normal component density ρ_n for solutions upon the concentration x for various temperatures: 1–1.4; 2– 1.5; 3–1.6; 4–1.7; 5–1.8; 6–1.9; 7–2.0° K.

It should be mentioned that the sharp break of the $\Theta - T$ curve at the λ-point may serve to locate the latter; the values for T_λ thus obtained agree well with other data reported recently[9].

We take this opportunity to thank Prof. B. G. Lazarev for his consideration of these results.

* In the present experiment the temperature was determined from the He^4 vapor pressure, with the aid of the 1949 tables[5].

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On the Total Energy of the β-Transition RaC – RaC′

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(Submitted to JETP editor July 19, 1956)
J. Exptl. Theoret. Phys. (U.S.S.R.) 31, 904
(November, 1956)

THERE exist a large number of works devoted to the study of the β-spectrum of RaC and the γ-spectrum of the excited RaC′ nucleus. Owing to the great complexity of these spectra, for a long time the diverse data obtained could not be made to conform, and to yield a perfectly definite scheme of the energy states of the RaC′ nucleus. Some authors[1,2] assume that the β-tansition with the highest limiting energy of 3.17 mev proceeds not to the ground level of the RaC′ nucleus but to an excited level with an excitation energy of 609 kev, which corresponds to a total β-transition energy of 3.78 mev.

In 1955, data obtained by studying the γ-ray spectrum of RaC′ by means of measurements of γ-γ and β-γ coincidences[3,4] were published. The absence of β–γ coincidences for the β-spectrum with the highest limiting energy furnished the basis for proposing the scheme according to which the β-transition with limiting energy 3.17 mev proceeds to the ground level[4]. It should be noted that the data of works published up to now do not exclude the possibility that the transition we are studying proceeds entirely to a metastable level rather than to the ground level.

During recent years, transitions of the type $E3$ or $M3$ were observed for some nuclei with half-lives of the order of a few hundred microseconds[5,6]. That an isomeric state with such a half-life also occurs in the case of RaC′(Po^{214}) is not excluded.

One can detect a metastable state by measurements of "delayed" $\beta-\gamma$ and $\beta-\alpha$ coincidences. The usual method for such measurements was employed. The impulses of a β-counter were fed to the coincidence circuit with a time delay t_d which could be adjusted from zero to a few thousand microseconds. Recording of "delayed" $\beta-\gamma$ coincidences were carried out without a selection in energies of the β- and γ-radiation. In these measurements, no metastable state was detected with half-life within the range 0.5 to 400 μ secs.

In registering "delayed" $\beta-\alpha$ coincidences, an aluminum filter was placed between the source and the β-counters. The thickness of the filter corresponded to the absorption of all the β-particles which give coincidences with γ-quanta, i.e., β-particles pertaining to the highest energy β-transition were registered. An exponential dependence of the number of $\beta-\alpha$ coincidences on t_d was obtained, corresponding to the α-decay of RaC′. It is obvious that this result excludes the possibility of the existence of a metastable state with long lifetime, preceding the α-decay.

Thus, comparison of the results from measurement of "delayed" β-γ and $\beta-\alpha$ coincidences allows one to assume that the β-transition with limiting energy 3.17 mev does not proceed to an isomeric level. The data obtained are in agreement with the decay scheme proposed by Johanson[4] and confirms that the total energy of the β-transition equals 3.17 mev.

The authors thank Prof. L. I. Rusinov for his attention and assistance in the completion of the current work.

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Decay of a τ'-Meson

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(Submitted to JETP editor July 20, 1956)
J. Exptl. Theoret. Phys. (U.S.S.R.) 31, 904-905
(November, 1956)

UPON further examination of a photographic emulsion[1] exposed in the stratosphere in May 1955, a particle was found to have stopped in the emulsion, decaying into a single positive pion which exhibited a typical picture of $\pi \to \mu \to e$-decay. The range of the μ-meson is 550 μ. The track of the primary particle is inclined at a large angle to the emulsion, and that of the secondary particle (the pion) is parallel to the emulsion. This complicates an interpretation of the event which might still be considered as the scattering of a pion. Measurements were carried out on the grain density of several pion tracks inclined at the same angle and going in the same direction as the primary particle. Comparison of the grain densities of these tracks with the density of the track under consideration indicated that the scattering of a pion is definitely excluded. This must therefore be a particle decay event.

The path of the pion measures 600 μ and its energy is $E = 4.6$ mev; this excludes the decay of a K-particle according to the scheme $K \to \pi + \pi^0 + Q$. The event may therefore be interpreted as the decay of a τ-meson according to an alternative decay scheme into one positive and two neutral π-mesons ($\tau' \to \pi^+ + 2\pi^0$)[2-4]. Upon retracting the τ-meson trajectory, it was found that the meson had entered the emulsion having been created outside, and covered a distance of 3.76 cm in the emulsion. It is difficult to determine the τ'-meson mass exactly because its track makes a large angle with the plane of the emulsion.

Grain density measurements were carried out for the given track and for the tracks of pions and protons lying at the same angle. Results of ionization measurements indicate that the mass of the particle in question is smaller than the mass of a proton but greater than that of a pion.

One may therefore conclude on the basis of ionization measurements that the particle might be a K-meson.

In conclusion, we should like to thank Prof. I. I. Gurevich for his expression of interest in this work.