a constant minimum value of the order of magnitude of $t(1+kT/h\nu)$, which is much greater than t and hence does not lead to a broadening of the line.

Irrespective of the details of the theory, it would seem that induced radiative transitions should not greatly broaden the line, as the time allowed for a measurement of the energy E of the system of (atom+radiation field of definite frequency) is the time t between molecular collisions and $\Delta E \cdot t = \hbar$, according to the Heisenberg uncertainty principle. At the time of measurement, the molecule may be in either an upper or lower state, differing by the definite amount $h\nu$, but either state uncertain in energy only to an amount $\hbar/t$. The line width, therefore, should not differ greatly from that given by theories of collision broadening.

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Radiations from K^{38}

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We have made a preliminary investigation of the beta- and gamma-radiations emitted from K^{38}. Radioactive K^{38} has been investigated by Hurst and Walke[1]; Pool, Cork, and Thornton[2]; and Ridenour and Henderson.[3] Hurst and Walke, Ridenour and Henderson produced this activity by the action of alpha-particles on chlorine, while Pool, Cork, and Thornton produced it by fast neutrons. The period was found to be 7.5–7.6 minutes. Walke and Hurst found a beta-ray end point of 2.0 Mev, while Ridenour and Henderson found 2.3 Mev.

We have studied the radiations from K^{38} with a view to correlating the energy levels of A^{38} formed by positron emission with those of the same element formed by the negatron emission from Cl^{38}, as reported by Hole and Siegbahn.[4]

K^{38} was formed by bombarding LiCl with 23-Mev helium ions from the cyclotron. This was separated chemically by adding KNO_3 carrier and bringing down the potassium as potassium cobaltinitrite. The absorption of the positrons in aluminum was measured, and the range was found to be 1.20 g/cm², corresponding to an end point of 2.53 Mev. The period was found to be 7.5 min.

The substance was shown to emit gamma-rays. The absorption of the gamma-rays in lead showed a highly absorbable component corresponding to an energy of about 0.5 Mev, no doubt caused by annihilation radiation, and a more penetrating component, corresponding to an energy of 1.5–2.0 Mev. Since the lead absorption coefficient varies only slowly with energy in this region, we determined the energy of the most energetic gamma-ray by measuring the range of the Compton electrons from an aluminum radiator with the help of a coincidence counting set.[5] The range of the Compton secondaries corresponds to a gamma-ray whose energy lies between 2.0 and 2.15 Mev.

Hole and Siegbahn[4] have measured the gamma-rays associated with Cl^{38} which come from excited levels of A^{38}. These have been found to be 1.60 Mev and 2.15 Mev, and are in cascade, the 2.15-Mev ray coming from the first excited state to the ground state of A^{38}. Our measurement of the gamma-ray at 2.15 Mev associated with K^{38} shows that the 2.15-Mev state of A^{38} is excited by positron emission from K^{38} as well as by negatron emission from Cl^{38}. Work is continuing with a view to obtaining the complete disintegration scheme of K^{38}.

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On the Positively Charged Particles Accompanying the Beta-Rays of P^{32}

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In the cloud chamber pictures of beta-ray tracks from radioactive sources such as $Ra(B+C)$, $Th(C+C'+C'')$, RaE, P^{32}, etc., a few tracks are often present because of positively charged particles.[1,2] The ratio of the number of positive particles to that of the ordinary decay electrons which has been found in this way by others ranges from 0.2×10^{-2} to 1×10^{-2}. But with the beta-ray spectrometer[3,4] this ratio was found only to be of the order of 10^{-4}.

We have recently taken about a thousand cloud chamber pictures of the beta-ray tracks of P^{32}. P^{32} was chosen in order to avoid the effect of gamma-rays. Since positive particles might be emitted by the source itself or created by the beta-rays, we took three series of pictures with the beta-rays filtered through materials of different thicknesses. In the first series the source was put in a thin-walled glass tube of thickness 0.01 g/cm², in the second we surrounded the thin-walled tube with an Al filter of thickness 0.11 g/cm², and in the third we used a source in a glass tube of thickness 0.09 g/cm². We chose filters of light elements in order to avoid the gamma-ray effect. The cloud chamber had a diameter of 8 inches. Air and ethyl alcohol vapor were used. The thin glass tube had a diameter of 1.1 mm and the thicker one and the Al filter had the same outer diameter of 2.1 mm, the length being about 4 cm. The radio-phosphorus in Na_2HPO_4 was deposited on the middle portion of the inner wall of the tubes, and the tube in each case was attached to the covering glass of the chamber. The magnetic field was about 360 gausses, and stereoscopic pictures were obtained by using two mirrors.

The result of our experiment is given in Table I.

Since tracks caused by negative particles moving towards the source might be mistaken for those of positive particles, the pictures are analyzed in the following way. (a) Both