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In the previous paper*, we reported the method by which one could obtain the absolute number of β-particles emitted from a sample by the use of 2π-type counter. In that case, we varied the distance between the top of a center wire and a mica window. Now, in the present experiments, we varied the diameter of the cathod cylinder. As the result, the same method led us to obtain a good agreeable value of the absolute number of β-particles emitted from the same sample. Then, this method was found to be applicable to more general use. However, it must be pointed out that when the diameter of the cathod of a counter is larger than that of the window, a value obtained by this method is a little smaller.

* The Reports of the Inst. for Chem. Res. Kyoto Univ., 21 (1950).

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49. Study on the Ion Source.

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We have constructed the new type ion source using the discharge in the magnetic field, which is durable and little consumable in electric power and yields comparatively much ion current. The discharge was produced in the cylindrical space of 1 cm. in diameter and about 3 cm. in length in the coaxial field of 200~400 gauss. At the center of which the doughnut anode and on both sides the cathodes which were also magnetic pole pieces were settled. The generated ions was protruded through the canal drilled in one cathode. When the ion source was operated at the discharging voltage of D.C. 1000~2000 volts and the vacuum pressure of 8×10^{-4}~3×10^{-3} mm Hg, the ion current of 20~300 μA could be obtained. In the case of hydrogen gas, about 60 % of the total ions were protons, and this ratio increased after long hours' operation.

Furthermore, we have tried the theoretical treatment of the ion beam passing through the canal and the conditions to obtain maximum ion current were derived. Good agreement was found between the calculations and the experimental results. Thus the most effective size of the canal of conductance 440 cc/sec. in the case of hydrogen was 0.1 cm. in radius and 0.52 cm. in length for protons having the energy of 1000 volts.