LETTERS TO THE EDITOR

Prompt publication of brief reports of important discoveries in physics may be secured by addressing them to this department. Closing dates for this department are, for the first issue of the month, the twentieth of the preceding month; for the second issue, the fifth of the month. The Board of Editors does not hold itself responsible for the opinions expressed by the correspondents.

The Ionization of the Noble Gases by Positive Alkali Ions.—A Correction

Dr. Otto Beeck has recently informed me of an error in his calibration of the McLeod gauge used in the work on the ionization of krypton and xenon by positive alkali ions on which we collaborated;[1,2] and also in the work on the ionization of neon and argon by myself.[3] He suggests that I publish the corrections in this country. The error was caused by his mistaking a piece of coordinate paper with 20 divisions per inch (used for the scale of the gauge) for one divided in millimeters. Thus an error of nearly 38 percent was made in the pressure readings. The values for the efficiencies of ionization (the number of electrons ejected from the gas per initial positive ion per cm path per mm pressure of mercury at 0°C) in krypton and xenon[1,2] and those in neon and argon[3] must be corrected.
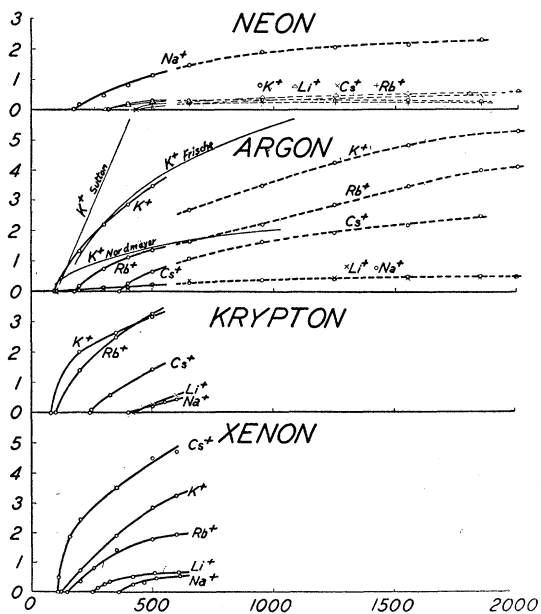

FIG. 1.

The corrected curves (see Fig. 1) for the efficiencies of ionization of the noble gases by the alkali ions are plotted with those of Beeck[4] for neon and argon; and those of Sutton,[5] Frische,[6] and Nordmeyer[7] for K+ in argon. The unmarked curves in neon and argon are those of Beeck[4] measured in Germany with accelerating potentials of 0–600

volts. The dotted curves are mine[3] (corrected) measured with an apparatus of design different from Beeck's with accelerating potentials of 600–2000 volts. The curves for krypton and xenon are those of Beeck and myself[2] (corrected). The efficiency of ionization is plotted as the ordinate while the accelerating potential in volts is plotted as the abscissa. The noteworthy feature of these comparative curves is the striking fit between the curves of Beeck and those of mine taken in neon and argon with apparatus of different design. The importance in this fit lies in the fact that it indicates that there is no measurable wide-angle scattering of the alkali ions in neon and argon except for the case of K+ in argon. My apparatus[3] was designed to record all positive ions entering the ionization chamber, while that of Beeck[4] recorded only those striking the collector plate. Any bombarding positive ions scattered outside the cone determined by the entrance slit of the ionization chamber and the collector plate would be lost in Beeck's apparatus. Therefore, if any wide-angle scattering occurred, my values for the efficiencies of ionization would have been lower than the previous ones. This is seen to be the case only with K+ in argon.

The correction of the pressures does not alter my statement concerning the "probability of ionization"[3] (the chance of an electron being ejected in a collision between a bombarding positive ion and a bombarded gas atom, calculated from the kinetic theory mean free path for the positive ions in the noble gases nearest them in the periodic table). The values of these "probabilities," computed from data taken with the same apparatus[1,4] with 500 volts as the accelerating potential of the positives, are: Na+ in neon, 0.025; K+ in argon, 0.026; Rb+ in krypton, 0.024*; Cs+ in xenon, 0.019*.

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  Durham, N. C.,
    August 23, 1933.

* Corrected values.
[1] O. Beeck and J. C. Mouzon, Ann. d. Physik 11, 737 (1931).
[2] O. Beeck and J. C. Mouzon, Phys. Rev. 38, 967 (1931).
[3] J. C. Mouzon, Phys. Rev. 41, 605 (1932).
[4] O. Beeck, Ann. d. Physik 6, 1001 (1930).
[5] R. M. Sutton, Phys. Rev. 33, 364 (1929).
[6] C. A. Frische, Phys. Rev. 43, 160 (1933).
[7] M. Nordmeyer, Ann. d. Physik 16, 717 (1933).