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.

Further Evidence for the Existence of K^{40}

Recently Nier[1] has obtained a peak at the 40 position in the mass-spectrographic analyses of the positive ions generated in potassium vapor, which he has been able to assign to K^{40}. Mass spectra of positive thermions emitted from various potassium sources have been obtained in this laboratory which confirm the existence of this isotope.

The potassium ion source in the present experiments was a platinum disk, 2 mm in diameter, held in position 6 mm above the immergent slit by a tungsten filament to which it was spot-welded. The disk was impregnated with potassium by first coating with a potassium-containing material, basalt and K_3PO_4 being used, and then heating to redness in vacuum for about one hour. After the heating the disk was washed in distilled water to remove any of the coating which might distort the accelerating field. During the heating process the platinum dissolves sufficient potassium to become an excellent emitter of K^+ ions.

[1] A. O. Nier, Phys. Rev. 48, 283 (1935).

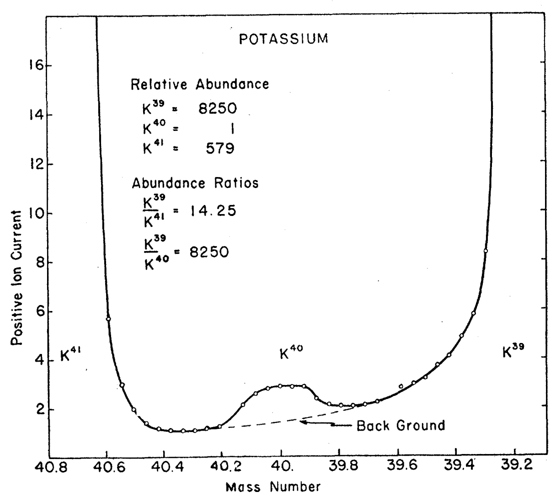

FIG. 1.

The accelerating potential between the disk and slit was maintained at 580 volts. The pressure, as recorded by an ionization manometer, was 3×10^{-6} mm.

A representative analysis of the region between the K^{39} and K^{41} peaks is shown in Fig. 1.

It will be observed that the peak is flat-topped and that the background is comparatively small.

The K^{39}/K^{41} abundance ratio has been measured for a large number of inorganic sources and has been found to be close to 14.25 with a probable error of about 0.03. The K^{39}/K^{40} abundance ratio estimated from curves of the type shown in Fig. 1 lies within the range of 8300 ± 100 in most every instance. The principal source of error is in the estimation of the background. These ratios are close to those obtained by Nier who found $K^{39}/K^{41}=13.96\pm0.1$ and $K^{39}/K^{40}=8600$.

The possibility of the observed peak being due to Ca^{40} is small since large changes in the calcium content of the source had no effect on the observed ratio; the measurements were made at a filament temperature below which a Ca^+ emission could be detected. The possibility of the peak being due to $K^{39}H^+$ is remote. It could not be due to a hydride formed about K^{39} ions in transit between the disk and slit since the chance of such formation is small and since ions so formed give a diffused and not a sharply defined peak. Again it is difficult to ascribe the peak to $K^{39}H^+$ ions emitted from the platinum since fresh filaments gave essentially the same ratio as did those that had been heated for 12 hours at 700°C; the high dissociation pressure of potassium hydride should materially reduce its concentration during this heating period. The fact that the abundance ratio is essentially the same as that obtained by Nier from an entirely different type of ion source strongly suggests the existence of an isotope of potassium of mass 40.

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