Internal Conversion Electrons from Br^{80}

Segrè, Halford and Seaborg[1] have recently reported that the 18 min. Br^{80} isomer is formed by the decay of the 4.4-hr. activity. They have concluded that the 4.4-hr. isomer has the greater energy. This is in agreement with the proton threshold measurements reported by Buck.[2] They also conclude that the 4.4-hr. radiation is probably composed entirely of low energy internal conversion electrons.

We have produced $Br^{78, 80, 82}$ by proton bombardment of thin selenium films mounted on 2.5μ Al foil. The negative electron spectra were examined in the region 13 kev to 150 kev with a β-ray spectrograph. We find two strong lines of electrons at 44 ± 1 and 33.5 ± 1 kev, respectively. These are accompanied by a third much weaker line at 21.5 ± 2 kev. We have shown definitely that the 44 and 33.5 kev lines belong to the 4.4-hr. Br^{80} period. The 21.5 kev line belongs either to the 4.4-hr. Br^{80} or to the 33-hr. Br^{82} with a much greater probability in favor of its belonging to Br^{80}.

We exposed four plates to different relative intensities of the various activities of $Br^{78, 80, 82}$ as follows:

Exposure	Plate No.	1	2	3	4
6.3 min. Br^{78}		70	130	0	0
18 min. Br^{80}		330	1140	0	0
4.4 hr. Br^{80}		52	450	455	0
33 hr.		2.5	48	250	300

The exposure figures given refer to measurements of the total radiation emitted by each isotope as measured with a N_2-filled ionization chamber. Plates 2 and 3 are reproduced in Fig. 1 and microphotometer measurements of these plates are shown in Fig. 2. It should be noted that (1) Plates 2 and 3 were exposed to the same intensity of 4.4-hr. activity and show the 44 and 33.5 kev lines at the same intensity, (2) Plate 2 was exposed to only 20 percent as much Br^{82} radiation as was Plate 3, yet shows the 21.5 kev line equally strong. Plate 1 was blank. Plate 4 was exposed the most intensely of all the Plates to Br^{82} radiation, yet shows only a small and questionable maximum around 20 kev.

The 44 kev and 33.5 kev lines agree within the experimental error with the expected values for L and K conversion in bromine of a gamma-ray of about 45 kev. The 21.5 kev line is either the result of L conversion of a 23 kev gamma or K conversion of a 34 kev gamma-ray. Since the existence of this 21.5 kev line is important to

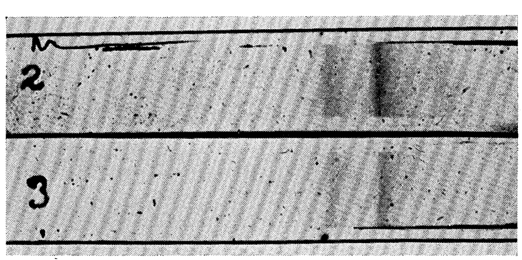

FIG. 1.

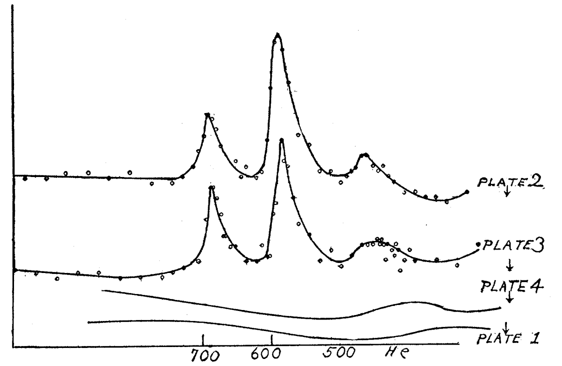

FIG. 2. Microphotometric measurements of the plates.

the theory of isomers we shall complete its examination shortly.

We wish to thank Professor L. A. DuBridge for suggesting this problem and to thank Dr. J. H. Buck for the selenium films.

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March 15, 1939.

[1] E. Segrè, R. S. Halford, and G. T. Seaborg, Phys. Rev. **55**, 321 (1939).
[2] J. H. Buck, Phys. Rev. **54**, 1025 (1938).

On the Nuclear Magnetic Moment of Beryllium*

The molecular-beam magnetic-resonance method, discussed in the preceding issue of the *Physical Review*,[1] measures g, the ratio of the magnetic moment to the angular momentum of a nucleus. For the nuclei therein reported the spins are known, and the magnetic moments were obtained directly from the product of the spins and the measured g values. Elsewhere in this issue a method of measuring the sign of the nuclear moment is described.[2] We have applied these methods to the study of the gyromagnetic properties of the beryllium nucleus, $_4Be^9$.

The molecules used in our experiments were sodium beryllium fluoride ($NaF\cdot BeF_2$) and potassium beryllium fluoride ($KF\cdot BeF_2$). The resonance minima we obtain yield values of $\mu/hI=f/H$ for the constituent nuclei of the molecules. There were two different values of f/H common to both molecules. One of these values agreed closely with that previously found for F^{19}. The other value must therefore be ascribed to Be^9. The value of f/H for Be^9 was found to be constant to 0.2 percent for frequencies ranging from 0.9×10^6 to 3.0×10^6 cycles per second. The value of g of Be^9 is 0.783 ± 0.003 when referred to that of Li^7 ($g=2.167$).[1]

The sign of the moment of Be^9, as determined from the systematic shifts of the positions of the resonance minima when the direction of the homogeneous field is reversed[2] is found to be negative. This is the first nucleus investigated by molecular-beam magnetic-resonance methods for which a negative magnetic moment has been found.

Since our experiment does not measure spin and since no

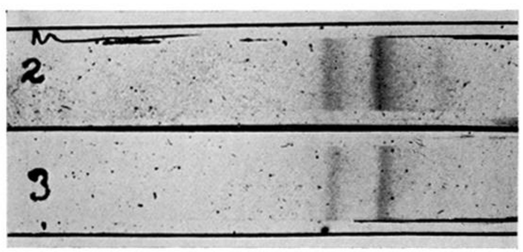

Fig. 1.