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.

Aluminum-Magnesium Mirrors

The writer has prepared metallic mirror surfaces which have shown unusually high and uniform coefficients of reflection throughout the visible light. These mirrors were made by evaporation of the metals in a vacuum and were deposited upon glass.

Surfaces made from pure aluminum reflected 89.5 percent of the light, incident at 10°, for each of the three regions of light used. For this purpose white light from a tungsten filament was filtered by using a standard set of the Wratten three color taking filters for tricolor reproduction work. The red filter (A25) transmits a band from approximately 7000 to 5800, the green filter (B58) from 6200 to 4800 and the blue filter (C5–47) from 5200 to 3600. Intensities were measured by a Weston Photronic cell.

Mirrors prepared by evaporating aluminum and magnesium were found to reflect 94 percent in each of the three color regions. Other mirrors were found to reflect 93 percent.

The unusual feature of such surfaces is their high reflection characteristics, particularly in the blue end of the spectrum. Front surfaces of silver, chemically deposited, reflect 95 percent at the red end of the spectrum, while only 85 percent at the blue end. The writer has not yet measured the reflection in the ultraviolet. Since the reflection power of these mirrors is uniform in the visible spectrum, one would expect a good performance in the ultraviolet, perhaps better than any known substance.

Unfortunately the exact composition of the aluminum magnesium surfaces has not yet been obtained with any reliability because of the difficulties involved in making an accurate quantitative analysis. A number of analyses have been made with results varying from 10 to 50 percent for the magnesium. The mass of the films is of the order of one milligram which makes reliable determinations rather difficult. Further experimental work is being conducted with the object of finding the best combination.

The best mirror yet obtained was made by evaporation from the two metals in separate pieces, the mass of the aluminum being 10 times greater than that of the magnesium. This, of course, does not mean that the reflecting surface had a similar composition, for while the melting points of the two metals are nearly identical (Mg 651°C and Al 658°C) the boiling point of magnesium is 1120°C and that of aluminum is 1800°C, hence one would expect the vapor pressure of magnesium to be the larger of the two and that the magnesium would therefore be deposited in a correspondingly larger ratio.

Mirrors made of a proper proportion of aluminum and magnesium should be of considerable value in various optical instruments where front surfaces of high reflecting power are desirable. A further admirable feature of this combination is to be found in the fact that the surface is protected by aluminum oxide which is exceedingly hard and is not as readily tarnished as silver. A detailed study of the preparation and properties of these mirrors is in progress and will be published as soon as it is complete.

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Actinouranium and the Geologic Time Scale

From all evidence now available it appears that the actinium series originates in one or more long lived isotopes of uranium, called actinouranium isotopes. The question is, whether one or two such isotopes exist. If there are two, their isotopic weights must be 239 and 235, and the actinium series would presumably be produced by the scheme of disintegration portrayed in Fig. 1. We shall use the subscripts 1, 2, 3, and 4 to designate quantities characteristic of the isotopes U^{238}(U I), U^{234}(U II), U^{239}, and U^{235}, respectively.

Hahn[1] has searched for the hypothetical beta-rayers required by the scheme of Fig .1 and has found no evidence for their existence. His work makes it very probable that there is a single actinouranium isotope, U^{235}, which is the immediate parent of UY. As a working hypothesis, we have assumed that such is the case; and have determined probable values of the decay constant and abundance of this isotope with the aid of existing physical and chemical data.

These data are: the "branching ratio" B of the uranium and actinium series; chemical analyses of certain radioactive minerals; the isotopic composition of the leads from these minerals; isotopic weights of Pb^{206}, Pb^{207}, and Pb^{208}, atomic weights of ordinary lead, and of thorium and uranium; the decay constant of thorium; and the present rate of disintegration of uranium. A critical examination of these data was found necessary. The results of the investigation are as follows.

[1] O. Hahn, Zeits. f. anorg. Chem. **147**, 16 (1925); Zeits. f. angew. Chem. **42**, 927 (1929).