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Radioactivity of $Eu^{152,154}$

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Although the spectrographic analysis accompanying severa1 enriched samarium isotopes from Oak Ridge contained <0.6 percent europium, some of the more intense internal conversion lines attributed to the disintegration of europium have been found photographically with neutron-activated samarium isotopes in a 180° focusing β-ray spectrograph.

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Letters to the Editor

Radioactivity of $Eu^{152,154}$

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ALTHOUGH the spectrographic analysis accompanying several enriched samarium isotopes from Oak Ridge contained ≤ 0.6 percent europium, some of the more intense internal conversion lines attributed to the disintegration of europium[1] have been found photographically with neutron-activated samarium isotopes in a 180° focusing β-ray spectrograph. Conversion lines of some gamma-rays designated by Cork *et al.*[1] as 122.0 (K, L, M), 244.3 (K, L), and 343.8 (K, L) kev were found on spectrograms of neutron-irradiated Sm^{150}, while conversion lines of these three gamma-rays, together with the K conversion line of the 123.2-kev gamma-ray, were found associated with neutron-irradiated Sm^{154}. Our energies for these gamma-rays were 121.2, 243.8, 343.8, and 122.4 kev, respectively. The spectrograph was calibrated with Cs^{137}. Assuming that the europium impurity was enriched in nearly the same way as the samarium, the abundance ratio of Eu^{151}:Eu^{153} would be markedly different in the two samples, being 6:1 in the Sm^{150} enrichment and 1:16 in the Sm^{154} enrichment. In addition to these long lived conversion electrons, hard gamma-rays (half-life >1 yr) of energy 990 kev in the Sm^{150} sample and 1170 kev in the Sm^{154} sample were found by absorption, in lead, in a geometry calibrated with Cs^{137} and Co^{60}.

The recently revised gamma-ray assignments in Eu^{152} and Eu^{154} by Keller and Cork,[2] insofar as they refer to the transfer of the highest energy (1116 kev) gamma-ray to Eu^{154} and of the 344-kev gamma-ray to Eu^{152}, are in good agreement with our data. These results appear to be in disagreement with Fowler and Schreffler[3] who have reported finding coincidences between conversion electrons from the 123- and 344-kev gamma-rays. Our data indicate that the 122-, 244-, and 344-kev gamma-rays are associated with the disintegration of Eu^{152} while the 123-kev gamma-ray appears to be associated with the disintegration of Eu^{154}.

It seems clear that the long lived activity assigned to Sm^{155} by Cork, Fowler, and Schreffler[4] consisting of gamma-rays of energy 950 and 242 kev (and listed under Sm^{145} in both the latest Seaborg table and National Bureau of Standards circular 499)[5] was the result of europium contamination. We have found conversion electrons of the 242-kev gamma-ray and/or the "950-kev" gamma-ray (Pb absorber) in nearly the same intensity in pile irradiated Sm^{148}, Sm^{150}, and Sm^{152}. The high energy gamma-ray was considerably weaker in a source of pile-irradiated unenriched samarium, further indicating that this activity was because of an impurity.

[1] Cork, Keller, Rutledge, and Stoddard, Phys. Rev. **77**, 848 (1950).
[2] H. B. Keller and J. M. Cork, Phys. Rev. **84**, 1079 (1951).
[3] C. M. Fowler and R. G. Schreffler, Rev. Sci. Instr. **21**, 740 (1950).
[4] Cork, Fowler, and Schreffler, Phys. Rev. **74**, 240 (1948).
[5] K. Way (private communication) stated that this long lived activity was listed as Sm^{145} in National Bureau of Standards Circular 499 (1950), since Sm^{155} was reported to be short lived.