Further Products of Uranium Cleavage

Recent work has demonstrated conclusively that when uranium is irradiated by neutrons, elements of much smaller atomic number are produced.[1] In this laboratory we have already found in the products of uranium disintegration a three-day tellurium which decays into a 2½-hour iodine.[2] Further experiments now demonstrate the presence of additional radioactive antimony, tellurium and iodine isotopes. Of these three elements the most thoroughly studied so far is iodine. A table of activities follows.

Antimony		Tellurium		Iodine
<15 min.	⟶	72 hr.	⟶	2½ hr.
				8 day
		40 min.	⟶	54 min.
		1 hr.	⟶	22 hr.
4.6 hr.	⟶	70 min.		
5 min.				
40 min.				

As previously pointed out the 72-hour tellurium and the 2½-hour iodine correspond to bodies formerly identified as "transuranic elements."[3] It is of interest to note that the 72-hour activity does not grow from a one-hour period as was reported by Meitner, Hahn and Strassmann. This was shown by making a series of quantitative tellurium extractions from an irradiated sample at 15-minute intervals. The eight-day iodine correspond to the known[4] I^{131}. Absorption measurements were made under identical geometrical conditions on samples of the eight-day iodine produced both by neutron activation of uranium and by deuteron activation of tellurium. The beta-ray absorption curves were identical. The 40-minute tellurium was established through quantitative iodine extractions from tellurium, which had been precipitated from an activated uranium sample. A series of as many as twenty iodine extractions were made from the tellurium at definite intervals. Decay curves of these extractions were followed and analysis showed two main components of 54-minute and a 22-hour half-life. It is barely possible that the 22-hour activity and the 54-minute body are isomers with the 54-minute activity having the highest energy state. The iodine was separated from tellurium by carbon tetrachloride extraction and by distillation of a solution containing dilute nitric acid. If some of the active iodine were converted to iodate and later converted into free iodine through recoil the observed results would be found. The 4.6-hour antimony activity was shown to decay into a 70-minute tellurium. Since it seemed possible that the 70-minute body might be the parent of the 22-hour iodine, this possibility was investigated with a negative result. The 70-minute activity could be[4] Te^{129} but that possibility has not been investigated. The five-minute and the 40-minute periods have not been completely identified as antimony. In the chemical procedure followed, germanium also appears with antimony. The five-minute activity could be the parent of the 72-hour tellurium. I wish to express my thanks to Professor E. O. Lawrence for his interest in this experiment and to the Research Corporation for financial support.

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[2] P. Abelson, Phys. Rev. **55**, 418 (1939).
[3] L. Meitner, O. Hahn and F. Strassmann, Zeits. f. Physik **106**, 249 (1937).
[4] J. J. Livingood and G. T. Seaborg, Phys. Rev. **54**, 775 (1938). The same authors have made further investigations (unpublished) which prove the 8-day iodine to be I^{131} and that a 70-minute tellurium activity is Te^{129}.