EUR 155.e
REPRINT

EUROPEAN ATOMIC ENERGY COMMUNITY - EURATOM

YTTRIUM-88 ON HIGH-ACTIVITY-ZIRCONIUM-95 FALLOUT PARTICLES

by

M. DE BORTOLI
A. MALVICINI
P. GAGLIONE
E. VAN DER STRICHT

1963

Joint Nuclear Research Centre
Ispra Establishment (Italy)
Health Protection Service

Reprinted from
SCIENCE
Vol. 139, No. 3561 - 1963

LEGAL NOTICE

The authors' names are listed in alphabetical order.

EUR 155.e

REPRINT

YTTRIUM-88 ON HIGH-ACTIVITY-ZIRCONIUM-95 FALLOUT PARTICLES by (in alphabetical order) M. DE BORTOLI, P. GAGLIONE, A. MALVICINI and E. VAN DER STRICHT.

European Atomic Energy Community - EURATOM
Joint Nuclear Research Centre
Ispra Establishment (Italy)
Health Protection Service
Reprinted from „Science", Vol. 139, No. 3561 - 1963, pages 1287-1288.

Yttrium 88 has been identified, by gamma spectroscopy, in residues of grass samples gathered in the neighborhood of the Euratom Research Center, Ispra, Italy. The yttrium-88 is associated with zirconium-95.

EUR 155.e

REPRINT

YTTRIUM-88 ON HIGH-ACTIVITY-ZIRCONIUM-95 FALLOUT PARTICLES by (in alphabetical order) M. DE BORTOLI, P. GAGLIONE, A. MALVICINI and E. VAN DER STRICHT.

European Atomic Energy Community - EURATOM
Joint Nuclear Research Centre
Ispra Establishment (Italy)
Health Protection Service
Reprinted from „Science", Vol. 139, No. 3561 - 1963, pages 1287-1288.

Yttrium 88 has been identified, by gamma spectroscopy, in residues of grass samples gathered in the neighborhood of the Euratom Research Center, Ispra, Italy. The yttrium-88 is associated with zirconium-95.

EUR 155.e

REPRINT

YTTRIUM-88 ON HIGH-ACTIVITY-ZIRCONIUM-95 FALLOUT PARTICLES by (in alphabetical order) M. DE BORTOLI, P. GAGLIONE, A. MALVICINI and E. VAN DER STRICHT.

European Atomic Energy Community - EURATOM
Joint Nuclear Research Centre
Ispra Establishment (Italy)
Health Protection Service
Reprinted from „Science", Vol. 139, No. 3561 - 1963, pages 1287-1288.

Yttrium 88 has been identified, by gamma spectroscopy, in residues of grass samples gathered in the neighborhood of the Euratom Research Center, Ispra, Italy. The yttrium-88 is associated with zirconium-95.

Reprinted from Science, March 29, 1963, Vol. 139, No. 3561, pages 1287-1288

Yttrium-88 on High-Activity Zirconium-95 Fallout Particles

Abstract. *Yttrium 88 has been identified, by gamma spectroscopy, in residues of grass samples gathered in the neighborhood of the Euratom Research Center, Ispra, Italy. The yttrium-88 is associated with zirconium-95.*

The gamma spectra of samples of grass from the neighborhood of the Euratom Nuclear Center at Ispra showed a photopeak at 1.85 Mev. This peak was observed for the first time when samples were collected for examination during the last week of July and the first week of August 1962.

Because this peak was associated with another at 0.90 Mev, the radiation could be attributed to yttrium-88. This hypothesis was fully confirmed when yttrium (Y) was isolated by chemical methods.

The activity accompanied the yttrium carrier during the various steps of the analysis, which included oxalate precipitations of the rare earths and solvent extraction with tributyl phosphate. The spectrum, measured on 24 August 1962, of hay and the spectrum of the separated Y^{88} are shown in Figs. 1 and 2 respectively.

Because of the difficulties encountered in dissolving the active component, we believed that the activity was concentrated on single particles, the bulk of which might be zirconium oxide. Fusion in mixtures of potassium and sodium carbonate were unsuccessful. The active component was dissolved finally with hydrofluoric and nitric acid.

Other samples were fractionated before chemical treatment with the hope of isolating a single particle that contained all the activity.

With the aid of the gamma spectrometer we separated such a residue, of which the dimensions were less than 0.1 by 0.5 mm, from each of the samples treated. Our work was greatly facilitated by the presence of a combined activity of (Zr^{95} + Nb^{95}) which was 10 to 20 times greater than the usual Y^{88} activity encountered.

Figure 3 shows a spectrum obtained with a particle. Other gamma emitters commonly found in fission products are absent. On one occasion only, there was some activity at 0.14 Mev, probably attributable to the isotopes cerium-141 and 144.

The ratio of the activities of (Zr^{95} + Nb^{95}) to Y^{88} varies in the rather narrow range of (1:10 to 1:20). On 1 October the activity of the "hottest" particle was 2000 pc (Zr^{95} + Nb^{95}), whereas the other particles all showed half this activity. Although we were not able to identify the particles by microscopy, we succeeded in isolating an active fragment of inorganic material, the diameter of which did not exceed 10 μ.

That local contamination is the source of Y^{88} is not likely for several reasons. There is no experimental work on Y^{88} here, nor does any work at the Center result in production of Y^{88}; none of the devices run for routine control of environmental radioactivity (air monitors, pot samples for fallout and so forth) showed Y^{88} activity; two samples taken at a distance of 75 km from here and in a direction where fallout of airborne contamination from work at the Center is highly improbable, were contaminated with Y^{88}.

The high specific activity of these particles makes them of interest to the health physicist even if he does not know whether they originated in some new material incorporated in nuclear bombs or in an uncontrolled release from a nuclear establishment.

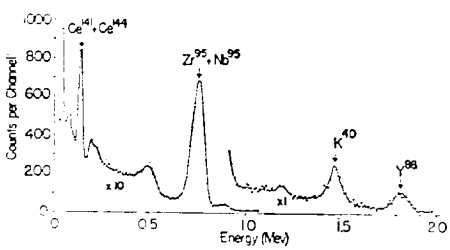

Fig. 1. Spectrum of hay sample, 24 August 1962.

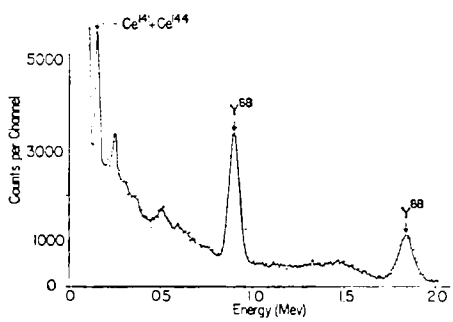

Fig. 2. Spectrum of Y^{88}, separated from hay.

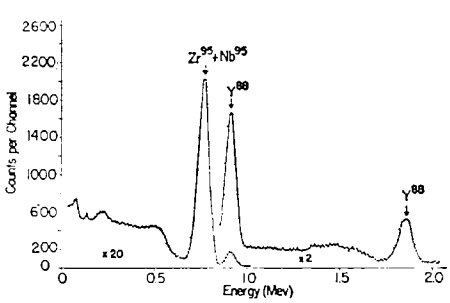

Fig. 3. Spectrum of a particle separated mechanically.

A. Malvicini, M. De Bortoli
P. Gaglione, E. Van der Stricht
Service de Protection,
Centre commun de recherche,
Euratom, Ispra, Italy

30 November 1962

CDNA00155ENC