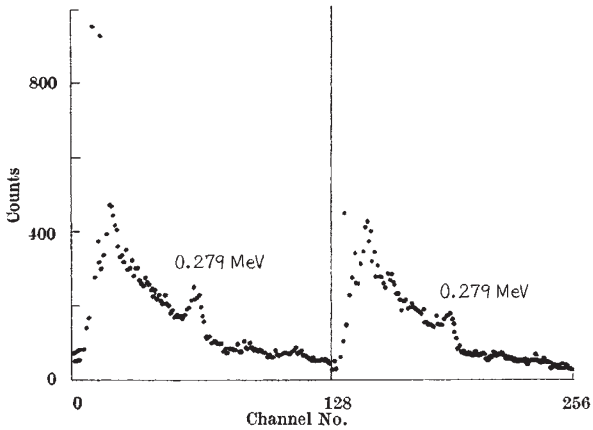

Fig. 1. γ-Ray spectrogram. Sample: 11·95 mg of a mixture of gold (9·4 per cent) and copper (90·6 per cent), both of which are in pieces

thick, well-type sodium iodide crystal attached to a 256-channel pulse-height analyser. During the counting operation the sample is placed 1 cm above the crystal together with its container. An aluminium disk of 2,150-mg/cm² thick is used as an absorber for β-rays from the sample.

An example of successive spectra thus obtained is shown in Fig. 1. From both γ-ray energy and half-life, gold is identified on the basis of the fact that, in the half-life range of 1–10² sec, there is no other nuclide having nearly the same γ-energy as gold-197*m*. From Fig. 1, which represents the spectra of a sample of 9·4 per cent gold content, it is deduced that one-third of this concentration would produce an adequate size of photo-peak. The lower limit of the coefficient of variation of single analyses can be deduced to be about 5 per cent in comparison with a similar method[2] of the determination of ytterbium.

Though the neutron-absorption cross-section of gold is rather high, the self-shielding effect is negligible for 12-mg sample used in this work. The effect can be estimated, by use of experimental data[3], at less than 5 per cent if the amount of gold in a sample is less than 0·06 g. (Larger amounts can be applied if the sample is not a massive block, or if gold is dispersed in copper.)

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[1] Anders, O. U., *Anal. Chem.*, **33**, 1706 (1961).
[2] Okada, M., *Nippon Kagaku Zasshi*, **83**, 85 (1962).
[3] Okada, M., *Intern. J. App. Rad. and Isotopes*, **13**, 53 (1962).

Rapid Microdetermination of Indium by Neutron Activation

It is known that 2·5-sec indium-116*mm* (ref. 1) is formed by neutron irradiation of natural indium and that it emits 0·15-MeV γ-ray. The size of the photopeak due to this γ-ray, obtained immediately after irradiation, can be estimated by the use of the data presented in a γ-ray spectra catalogue[2]. The peak size per 1 μg of indium is as large as that of silver when they are irradiated respectively for a period equal to the half-life of the nuclide formed, that is, 2·5 sec for indium and 24 sec for silver. Since silver is the most sensitive[3,4] in γ-ray counting after neutron irradiation, it is deduced that indium is also very sensitive.

In our experiment, varying amounts (0·01 ~ 10 g) of a sample were placed by turns in the nuclear reactor *JRR*-1 for 2·5 sec to be irradiated with neutrons at a flux of 3×10^{11} neutrons per cm²/sec, cooled for 5 sec, counted for 4 sec, again cooled for 1 sec and counted for 4 sec. The counter used is a 2-in. thick, well-type sodium iodide crystal attached to a 256-channel pulse-height analyser. During the counting operation the sample was placed at 1 cm above the crystal together with its container. An aluminium disk of 2,150-mg/cm² thick was used as an absorber for β-rays from the sample.

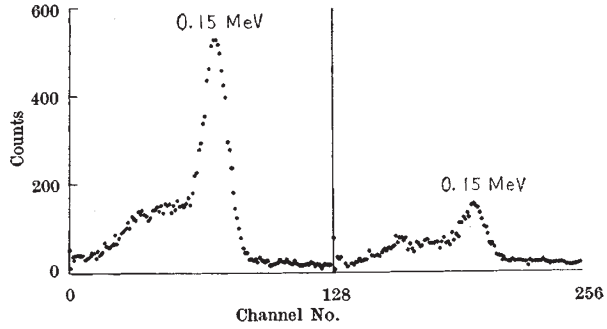

Fig. 1. γ-Ray spectrogram. Sample, 43·5 mg of zinc blende

A typical spectrogram thus obtained is shown in Fig. 1. From such successive spectra as Fig. 1 the half-life of the nuclide formed can be roughly determined. From both γ-ray energy and half-life, indium can be identified on the basis of the fact that, except indium-116*mm*, there is no nuclide, formed on pile-neutron irradiation, which emits a γ-ray of about 0·15 MeV and has a half-life of 1 ~ 10 sec. The amount of indium in the sample can be determined by the comparative method as usual. The results of analyses are shown in Table 1.

Table 1. Results of Analyses for Indium

Sample	Sample weight used (mg)	Indium found (p.p.m.)
A (zinc blende powder)	43·5	$1·3 \times 10^{3}$
B (thallium slab)	2,715	$3·6 \times 10^{-1}$
C (zinc grains)	6,019	$< 3 \times 10^{-2}$

The coefficient of variation of single analyses can be deduced (from a similar experiment[5] in which erbium was determined by use of the formation of 2·5-sec erbium-167*m*) to be about 10 per cent if the activity-level is suitable to the analyser used and interferences are negligible.

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[1] Stehn, J. F., *Nucleonics*, **18**, No. 11, 186 (1960).
[2] Okada, M., *Nucleonics*, **19**, No. 9, 79 (1961).
[3] Okada, M., *Nippon Kagaku Zasshi*, **81**, 1422 (1960).
[4] Meinke, W. W., *U.S. Atomic Energy Comm. Rep. TID-11009*, 75 (1960).
[5] Okada, M., *Nature*, **188**, 52 (1960).

Some Products of the γ-Radiolysis of Liquid Acetone

By irradiation of air-free liquid acetone the radicals $H^{\cdot}$, $\dot{C}H_3$, $CH_3\dot{C}O$ and $CH_3COC\dot{H}_2$ are formed[1–3]. Besides the known gaseous products[1] (methane, hydrogen, carbon monoxide and ethane), a mixture of oxygen containing liquid products arising from the radical–radical and radical–excited acetone reactions is formed.

I have studied this mixture partly by paper chromato graphy (carbonyl compounds as 2,4-dinitrophenylhydra