a spectrogram with γ-energies and decay characteristics similar to that found.

Finally, it should be pointed out that because of the short irradiation time, residual activity, after a few days decay, is minimal and the garnets may be recovered for additional investigations.

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[1] Koch, R. C., *Activation Analysis Handbook* (Academic Press, New York, 1960).
[2] Crouthamel, C. E., *Applied Gamma-Ray Spectrometry* (Pergamon, London, 1960).
[3] Strominger, D., Hollander, J. M., and Seaborg, G. T., *Revs. Modern Phys.*, **30**, 585 (1958).

Utilization of Increased Sensitivity of X-ray Fluorescence Spectrometry due to Polarization of the Background Radiation

In X-ray fluorescence analysis, the limit of detection of an element is usually set by statistical fluctuations in the continuous background at the wave-length of the most 'sensitive' line of the element. Consequently, the sensitivity of detection of an element will be improved if the intensity of the continuum is decreased. A typical example is the use of pulse height analysis with a detector the output pulse height of which is proportional to the energy of the incident quantum. By this means, overlapping orders of background can be rejected, resulting in increased sensitivity.

A further improvement can often be made as follows:

The background continuum consists largely of photons which are scattered (both elastically and inelastically) by the sample. Since the angle of scattering accepted by the collimator of typical instruments is about 90°, the scattered radiation is highly plane-polarized[1]. On the other hand, the fluorescent radiation in the line, being emitted some time after the photoelectric absorption of the exciting radiation, is completely random in direction and is unpolarized. Therefore, a marked improvement in line to background ratio could be achieved if one had a polarization analyser.

Such a device is a latent component of most X-ray spectrometers, in the form of the analysing crystal used to disperse the spectrum. Unfortunately, the optics of commercial X-ray spectrometers are usually arranged so

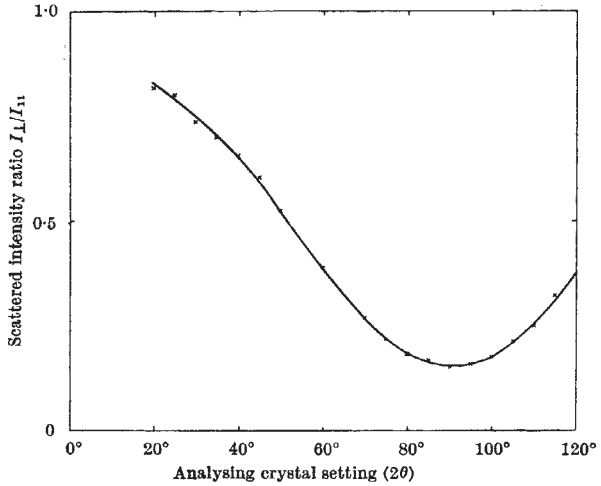

Fig. 1. Ratio of $I_\perp$ to $I_{\parallel}$ of X-rays scattered by water, plotted against angle of topaz analysing crystal

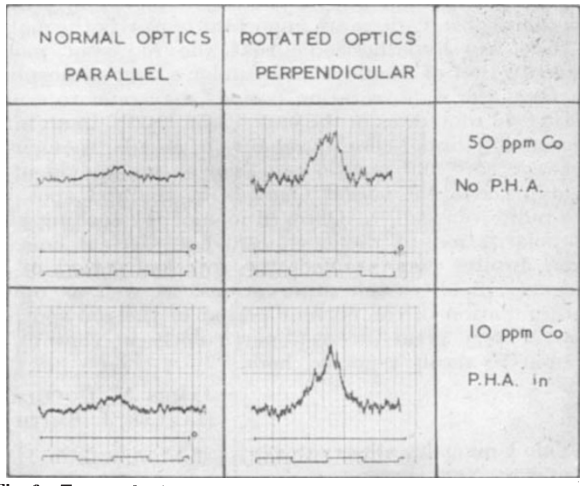

Fig. 2. Traces of cobalt K_α lines using conventional and perpendicular optics

that when the analysing crystal is at its optimum position for polarization ($2\theta = 90°$) the sample and analyser planes are parallel. It is not too difficult with the Philips *PW*1520 instrument to rotate the X-ray tube and sample holder about the axis of the collimator. When these are rotated by approximately 90°, the scattered radiation is considerably decreased for analyser settings in the vicinity of $2\theta = 90°$, as shown in Fig. 1.

The implications in analytical chemistry are illustrated in Fig. 2. The upper pair of traces show the significant improvement of detection of cobalt in aqueous solution (at $2\theta = 82{\cdot}5°$ for a topaz analysing crystal). For comparison purposes, the ratemeter was adjusted to give the same recorder reading for background in both cases.

The lower pair of traces indicates the extreme sensitivity of the method if both polarization of background and pulse height analysis are used.

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[1] Evans, R. D., *Handbuch Phys.*, **34**, 229 (Springer-Verlag, Berlin, 1958).

Influence of Electrode Coatings on Conduction Currents in Transformer Oil

Although the exact mechanism of conduction in dielectric liquids is still the subject of controversy, it has long been recognized that the surface state of the electrodes greatly influences the conduction process[1]. Recent experimental evidence[2,3] has shown that this conduction process is very sensitive to the surface state of the cathode, in particular to the presence of an insulating oxide layer. While it is known that oxide layers on the anode influence the electric strength of liquids[4], the influence of anode surface barriers or films on the conduction currents does not appear to have been studied.

This communication gives some preliminary results of conduction current measurements in transformer oil obtained using direct voltages, with both electrodes bare (*A*), both electrodes coated (*B*), cathode uncoated and anode coated (*C*), and cathode coated and anode uncoated (*D*). Further tests were made in which the coatings on both electrodes varied in thickness (*E*–*G*).

Both the coated and the uncoated electrodes were made of aluminium, polished to a 0·25-μ diamond paste finish. These had a uniform field profile and a nominal diameter of 2·5 cm. The coated electrodes were covered by a pore-free film of the thermoplastic, Penton; thicknesses of 0·5 mm and 0·75 mm were used. The transformer oil