There is a general shift to the right of the counts after correction 1 because many small profiles are sections through peripheral zones of large granules. After correction 2 there is a marked increase in the relative numbers of the smaller granules.

Only sections showing a mixed population randomly scattered were included in this analysis, avoiding regions such as the Golgi zone, where a variation in size of granules is common[2].

Table 6 shows the results of applying the same corrections to bovine A and N cells and also indicates that the size distribution of isolated granules is similar to those in sections of adrenal medulla allowing for the relative proportions of the two amines in the bovine adrenal medulla ($A : N = 75 : 25$) (ref. 3). The histogram (Fig. 5) clearly illustrates that bovine A granules have a larger mean diameter than N granules.

These methods are applicable at both the ultra-structural level and in light microscopy if an appropriate section thickness relative to object size and size ranges are selected, that is using the light microscope for nuclear size $0{\cdot}5 - 1\mu$ sections would be used.

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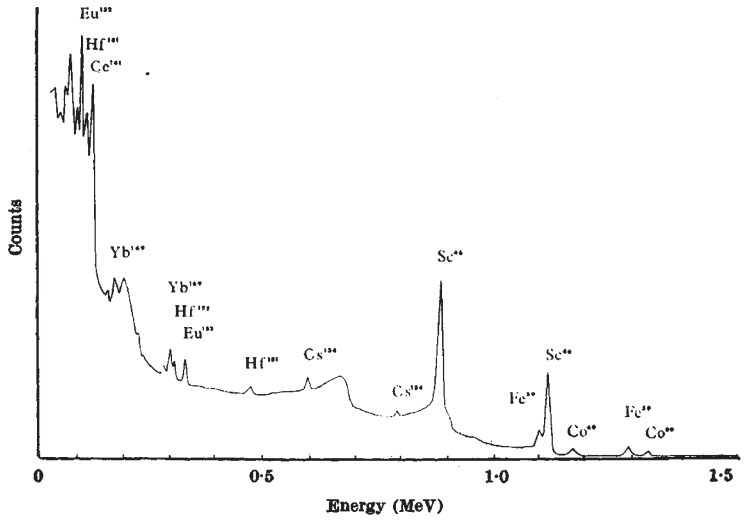

Fig. 1. A gamma ray spectrum for a shard from Holme-on-Spalding-Moor, Yorkshire, 100 h after irradiation.

GENERAL

Neutron Activation Analysis of Medieval Ceramics

AN increasing awareness of the number of British medieval pottery kilns working at any one time has thrown into sharp perspective the problem of establishing local ceramic sequences by programmes of kiln excavation. Traditional methods and residual magnetic dating techniques often enable reasonably precise dates to be given to kilns and thus their products. It remains, then, to establish a technique whereby material excavated from sites other than kilns can be identified back to its source of production, and thus to make use of scientifically established dates. Recently neutron activation analysis has been used with some success to distinguish between specimens of ancient pottery[1-5] and glass[6]. Differences in concentrations of trace elements in samples have been noted. A programme of work has therefore been initiated, using lithium-drifted germanium detectors, to examine the trace element constituents of pots from some eighty British kiln sites.

Preliminary experiments have been carried out on shards from Olney Hyde, Buckinghamshire, and Holme-on-Spalding-Moor, Yorkshire. Fragments of approximately 50 mg of materials were irradiated in a thermal neutron flux of 10^{12} n cm^{-2} sec^{-1} in the BEPO reactor, AERE, Harwell, for 100 h. Gamma ray spectra were then recorded at intervals during 6 weeks using a lithium–germanium gamma ray detector of sensitive volume approximately 7 c.c., which was coupled through appropriate amplifiers to a 1024 channel pulse-height analyser. A typical spectrum is shown in Fig. 1. Peak intensities were ascertained from the digital output of the analyser and corrected for background by averaging counts in channels on either side of individual peaks. The following active isotopes were identified in each sample: sodium-24, scandium-46, iron-59, cobalt-60, caesium-134, lanthanum-140, cerium-141, europium-152, samarium-153, ytterbium-169, thulium(?)-170, ytterbium-175, lutetium-177, hafnium-181. Not all of these, however, were amenable to quantitative analysis. In this preliminary experiment, all activities in a given sample were compared with that of the scandium 890 keV peak, when extrapolated to a fixed time after irradiation. Ratios thus obtained give an arbitrary indication of the trace concentrations, relative to scandium, in a particular specimen. These ratios for nine isotopes are given in Table 1. Very significant differences are apparent in the cases of lanthanum-140, europium-152 and samarium-153; the large differences in sodium-24 may be fortuitous in that no prominent photopeak of sodium was examined.

This investigation of shards from two kilns allows us to assume with fair certainty that fragments from one of the pots may be differentiated from those of the other, and a full programme of examination of kiln product groups has now commenced.

Table 1. RATIO OF RATE X TO RATE SCANDIUM-46 AT 1600 h ON MARCH 14, 1967

Isotope X	^{46}Sc	^{24}Na	^{59}Fe	^{60}Co	^{134}Cs	^{140}La	^{141}Ce	^{152}Eu	^{153}Sm	^{181}Hf
Specimen 1	1	0·7	0·112	0·038	0·12	5·0	0·85	0·32	12·1	0·066
Standard deviation		±0·1	±0·003	±0·003	±0·02	±0·2	±0·04	±0·02	±0·3	±0·006
Specimen 2	1	1·4	0·099	0·046	0·09	2·0	0·69	0·22	4·8	0·067
Standard deviation		±0·3	±0·003	±0·003	±0·01	±0·1	±0·05	±0·02	±0·2	±0·008

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