Blowpipe Analysis on Asbestos Paper

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The advantages of asbestos paper over charcoal and Plaster of Paris are reviewed.

Introduction

For many years blocks of compressed charcoal have been the most widely-used supports for test material when conducting blowpipe analysis. This material has several points in its favour. The blocks are easily handled when making a test owing to their low thermal conductivity and this property, together with the fact that the heated charcoal near the test substance actually burns, enables a comparatively high temperature to be maintained with a fair degree of ease. Moreover, the charcoal in contact with the substance under test actually takes part in the reduction process. A further advantage is that even small quantities of arsenious oxide, etc., are easily seen on the black surface. On the other hand, the blocks are comparatively heavy and bulky and only about eight tests can be carried out on each block without serious risk of contamination. This means that the consumption of blocks is high.

To offset this disadvantage hemispherical pastilles of compressed charcoal are available. When making a test the pastille is placed in a depression in a suitable holder and when the analysis is completed the pastille is discarded.

Plaster of Paris tablets have also been long in use and these are superior to charcoal blocks when carrying out bismuth flux, cobalt nitrate, and hydrobromic acid tests, as the colours of the resultant products are considerably clearer. The manufacture of such tablets is somewhat tedious and they are fairly bulky and fragile. White sublimates may be seen when using such blocks by first "smoking" the surface with a candle flame. Plaster of Paris tablet tests are usually regarded as supplementary to charcoal block tests. Only a few tests can be carried out on a given plaster of Paris tablet without serious risk of contamination. The preparation of plaster tablets [1] and the tests which may be conducted on them have been fully described by Smith (3) (1953).

Tominaga and Satô (1951) (2) have increased the diagnostic value of blowpipe tests and at the same time removed some of the disadvantages associated with the use of the above supports, by carrying them out on portions of quartz-glass plate. The melts, encrustations, and beads so obtained are examined by eye, by microscope, and by the application of wet reagents. The advantages of this method, other than those which are self-evident, are the absence of ash, the clarity of encrustation colour, and the durability of the plate.

Asbestos Paper

Recently the writer has described a flash-fusion technique which may be carried out on asbestos paper and by means of which minerals insoluble in the common attacking reagents may be rapidly converted into easily-soluble compounds (Hosking, 1953) (1). Asbestos paper may also be used as a support for the sample under test during blowpipe analysis and often considerably smaller quantities of material may be tested on asbestos paper than on a charcoal block. Only one sample is tested on a given portion of paper and thus there is no possibility of contamination by the residues from earlier samples.

A square inch of asbestos paper is sufficient when carrying out oxidation tests not involving the identification of a sublimate and also for cobalt nitrate tests and reductions and fusions with fluxes. The sample, together with any additional solid reagents required, is placed in the centre of the paper, which is held with forceps during the period

[1] Camborne School of Metalliferous Mining.

[1] References are given at the end of this note.

of heating. There is usually no difficulty in retaining the sample on the paper, but should such a difficulty occur it may be overcome by bending the paper so that it assumes the form of a shallow dish, or by slightly damping the sample.

In order to obtain a metallic bead by reduction a portion of the finely-ground sample, intimately mixed with about two volumes of fusion mixture and one of powdered charcoal, is heated before the reducing flame of the blowpipe. The metallic bead, or beads, so produced can, if it is desirable, be isolated by cutting out or tearing off the test area of the asbestos paper and lightly grinding it with a little water in a small agate mortar. The lighter components can then easily be removed by adding successive small quantities of water, agitating, and decanting. This method of separation is not applicable to bismuth beads as they are very brittle.

Products of both oxidation and reduction may be further examined, without removing them from the paper, by the direct application of wet reagents. This gives the asbestos paper technique a distinct advantage over charcoal and plaster of Paris. For example, if a grey metallic bead, presumed to be lead, has been produced by reduction, its identity may be confirmed by first adding one drop of concentrated nitric acid to the test area and warming over whatever flame is available to increase the rate of solution of the metal and also remove any excess acid. One drop of a 10% w/v aqueous solution of potassium iodide is then added to the acid-treated spot and the development of an intense yellow colour confirms the presence of lead.

Owing to the iron content of the paper, wet tests for that element should not be carried out on it.

Any test involving the development and recognition of sublimates is best done on a piece of asbestos paper about 8 cm. long and 4 cm. wide. If the sublimate is likely to be white, as in the case when an arsenide or an antimony mineral is heated before the oxidizing flame, then the surface of the paper should first be blackened by "smoking" it over a candle flame. In order to carry out any of the sublimation tests successfully on asbestos paper the heating of the test substance must be comparatively gentle, or the sublimate will be driven off the paper.

The advantages of carrying out blowpipe analysis on asbestos paper are as follows:—

(1) Sufficient paper for a great number of tests can be carried into the field without inconvenience.

(2) There is no possibility of contamination by products from previous tests as a fresh piece of paper is used for each test.

(3) Smaller quantities of material can be tested on asbestos paper than on a charcoal block.

(4) The colours of encrustations and of the residues from cobalt nitrate tests are clearer than on a charcoal block.

(5) Wet tests can be applied to the products of blowpipe analysis without removing them from the paper.

References

(1) Hosking, K. F. G., The Mining Magazine, **89**, 1953, 137–142.

(2) Tominaga, H., and Satô, Y., *Sci. Rep. Res. Inst. Tôhoku Univ.*, **A3**, 1951, 133–6.

(3) Smith, Orsino C., "Identification and Qualitative Chemical Analysis of Minerals." New York: Van Nostrand Co., Inc., 1953, 47–51 and 78-80.

Ore-Dressing Notes

12) *Diamonds*

New Type of Grease Belt

Until comparatively recently it has not been possible to arrest South-West African diamonds on a grease table. Difficulties arising from deterioriation of the surface of these stones have now been overcome and a variation of the standard grease table is in use.[1]

[1] *Optima*, June, 1953.

In standard grease tabling the ore is first concentrated, nowadays by dense-media methods, the concentrate being then sent over an inclined table covered with a thick grease layer. Water washes down the wet gravel particles, but the diamonds, which have hydrophobic surfaces, adhere firmly to the grease and are periodically scraped off. Diamonds from the Consolidated Diamond Mines of South-West Africa will not, it has been found, adhere to grease in the condition in which they are recovered and until recently most of them had to be hand sorted. This led to rather high losses and research work