

nation of τ^2 by Venter's method. What is interesting, however, is Venter's approach to the reverse problem, which is that of assessing the required mass of sample (as illustrated in his example). This provides a ready means of determining the size of sample which must be taken if the results are going to be acceptable to any given degree of precision, and, whether or not the sample is biased, results will not be meaningful unless at least that size of sample is obtained. Hence, once the required size is determined it will be possible to devise a sampling method to suit the circumstances by, say, taking a large number of small samples or a small number of large samples to make up the required total mass.

A necessary preliminary is the particle size analysis, combined with an assay of each particle to determine the quantities σ_q and ρ required by equation (3). This is where application of the Venter analysis will present particular practical difficulties. Can one expect that once these quantities are determined via a preliminary sample for a particular orebody and rockbreaking method they will remain reasonably constant for all bulk samples derived from that broken ore? Or will they be related in some way to the average value of ore in the same way as the parameter τ is dependent upon π as demonstrated in equation (3)? If the second suggestion is true, then

it will be necessary to carry out a preliminary particle by particle analysis each time a bulk sample is taken, and the volume of assay work demanded will reach insuperable proportions.

It would appear therefore as if the application of this technique on a regular basis to methods such as the broken ore sampling developed by the Rand Mines Group may not be warranted. In special areas, however, such as in metallurgical tests of newly-developed ore deposits or the sampling of large shipments of bulk ore, and in day-to-day control in reduction works where grade and particle size distribution can be assumed to be constant within necessary limits, Professor Venter's contribution is a valuable one.

In passing, it is perhaps necessary to draw attention to an elementary point; the parameter τ which characterises the precision of the sample is independent of the size of the population. This is presumably a consequence of the requirement in assumption A that sampling be performed with replacement. The violation of this assumption can be ignored as long as the sample is very small compared with the mass from which it is being taken, and hence it is doubtful whether this analysis can be applied to sampling from small populations.

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REPORT — VERSLAG

No. 1371

CONCENTRATION OF THE NOBLE METALS BY A FIRE-ASSAY TECHNIQUE USING NICKEL SULPHIDE AS THE COLLECTOR

15th October, 1971

Investigators: R. V. D. Robért, E. van Wyk, R. Palmer

SYNOPSIS

This report describes the investigational work on the development of a fire-assay method capable of concentrating, in a button of nickel sulphide, all six of the platinum-group metals present in samples of ores, concentrates, and mattes. In the method adopted, the sample is fused with a mixture of sodium carbonate, sodium tetraborate, nickel carbonate, and sulphur. The nickel sulphide formed during fusion collects the noble metals and carries them to the bottom of the crucible. The nickel sulphide button is dissolved, and the noble metals are isolated and determined.

The coefficients of variation range between 1,0 and 4,9 per cent for the various platinum-group metals when they are present in concentrations between 0,3 and 75 p.p.m.

CONCLUSIONS

Apart from the possible incomplete collection of platinum and gold, the nickel sulphide procedure offers a precise and accurate method for the concentration and isolation of the noble metals in samples of ores, concentrates, and mattes. Of the methods examined, it is the only one that provides for the determination of ruthenium, iridium, and osmium in the p.p.m. range in ore samples.

Its applicability to the different samples thus far encountered, together with the simplicity of the technique, renders it an extremely useful procedure for the analysis of the noble metals.

Publications on the Seventy Fifth Anniversary of the Institute

"South African Mining and Engineering Journal
Commemorative Volume 24th March, 1969".

"South African Institute of Mining and Metallurgy
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