Platinum Group Elements Determination in NiS Fire Assay Button by UV Laser Ablation ICPMS

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The nickel sulfide fire assay is the procedure most frequently used to separate the platinum group elements (PGE's: Ru, Rh, Pd, Os, Ir, and Pt) from the matrix of geological samples prior to their determination by any of the high sensitive techniques like NM, ICPMS, or GFAAS. For an NiS fire assay, the sample is mixed with an appropriate flux, usually a mixture of sodium carbonate and tetraborate. Nickel and sulfur powders are added and the whole mix is fused in a large fire crucible. During fusion, the PGE's are collected by the sulfides which are formed and settle as a separate phase. The NiS button is then adequately dissolved and the PGE's are separated by filtration and treated according to the requirements of the analytical technique to be used.

The NiS fire assay has the advantage of accommodating large amounts of sample, which allows good concentration factors to be achieved and, at the same time, decreases the possibility of the unwanted nugget effect happening.

During the last years, several authors described improvements aiming to eliminate losses or incomplete recoveries which might occur at the various steps of a complete fire assay procedure. Also, the introduction of the reduced mass NiS buttons was an important advance toward lower blanks and consequently better detection limits. The reduced mass NiS button enhances the concentration factor, which allows the direct analysis of the button without the dissolution steps. Recently, Jarvis et al. [1] described the determination of the PGE's directly in the reduced mass NiS button by laser ablation ICPMS. Their results were encouraging but the detection limits they reported were high, considering the levels of the PGE's in the majority of geological samples.

In the present work, the initial experiments for the determination of the PGE's directly in the NiS button using an ultraviolet laser ablation source with a Finnigan MAT Element high resolution ICP mass spectrometer will be reported. The NiS buttons are obtained with concentration factors of at least 15. An assessment of detection limits, precision and accuracy obtained for some of the CCRMP and IGGE reference materials will be presented.

[1] K.E. Jarvis et al. 1995 Chem. Geol. 124:37–46