



Determination of Trace Elements in Prepared Geological Standards by Laser Ablation ICP-MS

Laser Ablation of Minerals with CETAC LSX-100

Problem: Laser ablation (LA) is used extensively in earth sciences research for both bulk and spatial analysis of geological samples. In many cases data obtained from the latter does not require quantitation since trends in mineral composition are often the prime requirement. However when quantitation is required, very close matching of samples with standard sample types is often necessary.

Solution: The more controlled ablation process of CETAC LSX-100 UV laser sampling system provides much gentler ablation conditions than for example with IR radiation. More uniformity in laser sampling between different minerals is thus possible reducing some of the need for very stringent matching of standards and samples in many cases. In the example illustrated herein, an andesite AGV is quantified using the basalt standard BHVO.

Advantages:

- w Ablation at UV wavelength (266nm) ensures controlled and hence optimum coupling to all materials.
- w TEM₀₀ mode of operation giving true Gaussian beam profiles.
- w Computer driven zoom facility for rapid and accurate sample location.

Matrices: Mineral sections prepared in epoxy.

Results: The samples were prepared as powder standards mounted in epoxy. A range of different mineral types were placed on the same sample template and each mineral calibrated against one of a different type. The andesite AGV was quantified against the basalt standard BHVO to ascertain the closeness of this approach. Results are shown on Table 1 for a range of elements in both minerals. The correlation between the results is very good in most cases showing that exact matching of standards may not always be a pre-requisite when the UV laser system is used.

Conclusions: The initial results of this study indicate that the CETAC LSX-100 UV laser ablation system provides a more uniform coupling between different mineral types hence allowing one mineral to be used as a standard for quantitative analysis of another of slightly different composition.

	<u>AGV</u>		<u>BHVO-1</u>	
<u>Element</u>	<u>Given Value</u>	<u>Measured value</u>	<u>Given Value</u>	<u>Measured Value</u>
	<u>ppm</u>	<u>ppm</u>	<u>ppm</u>	<u>ppm</u>
Li	12	11.7	4.6	4.8
Be	2.1	2.2	1.1	1.36
Ti	6,295	5,696	16,610	16,368
V	121	116	320	348
Cr	10.1	8.6	289	152
Mn	712	709	1,301	1,213
Fe	4,728	4,660	8,554	8,394
Co	15.3	14.8	45	41
Cu	60	58	136	87
Zn	88	87	105	23
Sr	660	662	320	409
Y	20	21.5	28	25
Zr	230	223	180	170
Nb	14.5	14.3	19.5	17
La	39	40	15.5	16
Ce	70	69	38	41
Pr	8	8.3	5.45	5.4
Nd	32	33	24.7	24
Sm	5.9	6.9	6.17	7.5
Eu	1.55	1.58	2.06	2.2
Gd	4.7	4.7	6.22	6.1
Tb	0.7	0.6	0.99	1.07
Dy	3.8	4	5.25	5.95
Ho	0.7	0.8	1	0.82
Er	1.9	1.7	2.56	1.93
Tm	0.28	0.25	0.34	0.27
Yb	1.75	1.88	1.98	1.73
Pb	37	36	2.1	0.56
Th	6.5	6.1	1.25	1.14
U	1.9	1.9	0.41	0.5

Table 1. Quantitative results for AGV calibrated against BHVO and vice versa.