Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)
©2009. Japan Geoscience Union. All Rights Reserved.

SGC065-01 Room: 301A Time: May 23 09:00-09:15

Simple and quick quantitative analyses of trace elements in rock powder using LA-ICPMS

Yoshiaki Kon[1*], Hiroyasu Murakami[1], Takafumi Hirata[2]

[1]AIST, [2]Kyoto Univ.

Analysis of the trace elements in the whole rock samples is very important to unveil the insight of the geological processes for the samples. Recent progress in the analytical tools enabled us to determine the trace-element abundances from geochemical rock samples. Commonly, coupling of laser ablation-ICP-mass spectrometry and the compressed powder-pellet using XRF and/or acid decomposition method has been widely employed because of its high sensitivity and reliability of the data as well as user friendly operations. For the LA-ICPMS analysis, alkali fusion (Awaji et al., 2006), and alkali fusion glass bead (Orihashi & Hirata, 2003) are proposed, however, these methods have several inherent drawbacks. With the XRF method, analytical sensitivity is sometime not high enough to determine trace elements, including rare earth elements (REE). In the case of acid digestion technique, great care must be given to the complete digestion or dissolution of some heavy-minerals or accessory minerals, such like zircon, crhomtite, apatite or monazite. Moreover, laser ablation of alkaline fused-glass beads can cause serious memory effect onto the instruments (Na, Li and B), and therefore, determination of the trace level of alkaline elements became very difficult. To overcome this, we propose another alternative method for the analyses of trace elements in rock powder using the powdered pellet and the LA-ICPMS technique.
Present technique has several advantages: 1) higher sensitivity relative to XRF method, 2) contribution of the heavy minerals can be reduced by the laser ablation of wider area, 3) memory effects can be minimized, 4) easier sample preparation results in higher sample throughput of the analysis. However, it should be noted that this technique has a potential problem that lies at the root of nugget effect. The effect was mainly originating from the contribution of the accessory minerals in the heterogeneous sample powders. To reduce the nugget effect, laser ablation of larger sample volume was employed. Moreover, we have tried to improve the transport efficiency of the laser-induced sample-aerosols from the sample cell to the ICP ion source. Furthermore, we employed the larger volume stabilizer to prevent the larger sample aerosols, which could cause the spiky signal intensity profiles. The resulting abundance data for some GSJ geochemical rock standards demonstrated that the data obtained here were consistent with the data reported by the previous works.

Keywords: LA-ICPMS, whole rock analyses