Laser microprobe silicon isotope analysis method and geology applications

J.F. GAO AND T.P. DING

Institute of Mineral Resources, CAGS,Beijing,100037, China
(*correspondence: tony_and_mary@126.com)

A laser extraction system has been assembled successfully and combined with MAT-253 mass spectrometer to form a laser analytical system for very small amounts of materials with high spatial resolution, fast analytical rate, less sample consumption and high melt temperature in this study. Sapmples were heated by a CO_2 laser and reacted with BrF_5 in reactor in short time, then extracted and purificated SiF_4 from V_2 to V_9 and analysed with MAT-253 (Fig. 1).

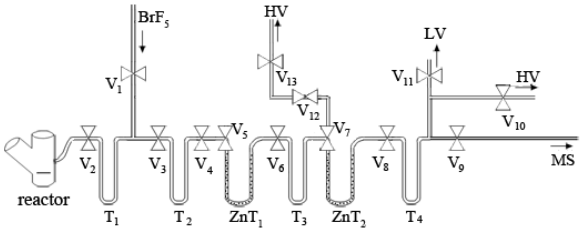

Figure 1: The diagram of laser microprobe extraction and purification system for silicon isotope.

The minerals of quartz, garnet and olivine are analyzed. The analytical precision of particle samples is about ±0.20‰, and its silicon contents for analysis are reduced to 6μMol. The analytical precision of *in situ* quartz glass is ±0.18‰, and its silicon contents for analysis are reduced to 7μMol(Table1).

Sample	Weight (mg)	Time	$\delta^{18}O_{V-SMOW}$(‰)(Mean)
Quartz glass	**0.5**	**27**	**0±0.15 ‰ (particles)**
Quartz glass	**0.4**	**8**	**0±0.18 ‰ (*in situ*)**
Garnet	**1.0**	**24**	**-1.22±0.17 ‰**
Olivine	**1.0**	**7**	**-0.33±0.19 ‰**

Table 1: Laser analysis results of silicon isotope.

This method is intended to use for studing the homogeneity and variation of silicon isotopic composition in different zones, and it could be used to investigate silicon isotope trace amount variations on dissolved silicon and biogenic silicon besides natural minerals.

MnO_2-mediated transformation of the antimicrobial sulfamethazine

JUAN GAO[1], TAN GUO[2], CURTIS HEDMAN[3]
AND JOEL PEDERSEN[3]*

[1]University of Michigan, Ann Arbor, MI
[2]Rice University, Houston, TX
[3]University of Wisconsin, Madison, WI
(*correspondence: japedersen@soils.wisc.edu)

Birnessite family minerals are the most commonly occurring manganese oxides, and rank among the strongest natural oxidants in soils and sediments. The reaction kinetics and products of δ-MnO_2 mediated transformation of the veterinary antimicrobial compound, sulfamethazine, were determined as a function of solution composition. Increases in temperature enhanced reaction rates, while increases in ionic strength depressed the reaction rate. Increases in proton activity accelerated sulfamethazine transformation by δ-MnO_2. Major products of sulfamethazine transformation were identified by HPLC-UV-MS/MS and HPLC-TOF MS including two products generated only in the presence of O_2 and one azo dimer . Because different sulfamethazine transformation products were observed from δ-MnO_2-mediated transformation in the presence and absence of oxygen, additional experiments were conducted using $H_2{}^{18}O$ and $^{18}O_2$ followed by mass spectrometric analysis to better clarify reaction mechanisms.