

Online oxygen isotope analysis of biogenic opal using the inductive high-temperature carbon reduction method with continuous flow isotope ratio mass spectrometry

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Biogenic opal is produced by amorphous silicate produced by diatoms, radiolarians and sponges. Oxygen isotope ratio of biogenic opal has a potential to be a quantitative paleo-proxy likewise the oxygen isotope ratio of foraminiferal shell (calcium carbonate). Here we present a method for determining sub-milligram quantities of biogenic opal [1]. The method employs the inductive high-temperature carbon reduction method for dehydration of opal and reduction of silica [2], and a continuous-flow isotope ratio mass spectrometry system for direct analysis of the oxygen isotope ratio in the evolved carbon monoxide. The accuracy and precision of the online analytical system were evaluated by isotopic analysis of various quantities of standard SiO₂ in the range 40–538 mg. The time required to analyse a single sample was ~50 min. hence, our method is suitable for routine analysis for paleoenvironmental studies that require large amounts of time-series data. The method was validated for samples in the sub-milligram range and can be applied to oxygen isotope analysis of various types of biogenic opal.

[1] Ijiri et al. (2014) JQS 29, 455-462.

[2] Lücke et al. (2005) GCA 69, 1423-1433.