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Oxygen isotope analyses of phytoliths and lacustrine diatoms using a laser-extraction technique for paleoenvironmental applications.

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The potential for the use of oxygen isotopes from phytoliths and diatoms as proxy of paleoenvironments (temperature and δ^{18}O of water) is very promising, but methodological improvements are still necessary. We report here a laser heating protocol which allows to extract oxygen from phytoliths and diatoms, prior to oxygen isotopic analysis. Up to now, the laser method has never been applied to biogenic silica which is commonly analyzed using the conventional fluorination method. The laser heating technique involves lower amount of material and is less time-consuming than the conventional one.

Exchangeable oxygen contained in phytoliths and diatoms are first equilibrated with waters of known isotopic composition. Particles are then heated up to 1050˚C. They are melted and vaporized under a CO_2 IR laser beam of 17W in a BrF5 atmosphere. Molecular oxygene is analysed by IRMS. Twenty-nine analyses of 1.6 mg of samples are processed over 4 days. Laboratory standards of phytoliths and diatoms are analyzed. We evidence an oxygen enrichment due to the chemical separation of phytoliths at temperature higher than 50˚C. External precision (1σpgf the whole procedure (exchangeable oxygen equilibration, oxygen extraction by laser heating, oxygen isotopes measurement) is lower than 0.35‰ for phytoliths and lower than 0.50‰ for diatoms. These are close to external precisions obtained using the conventional fluorination method (0.2-0.3‰ for phytoliths; 0.5‰ for diatoms). They are higher than external precision obtained with the new method "High-Temperature carbon reduc-

tion technique" (g.15%,). The laser-heated fluorination technique brings significant improvement for the analysis of δ^{18}O of biogenic silica particles and their use as quantitative proxy of water cycle and paleo-environments.