Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.16455

An improved FT-TRA system and its application to element analysis of foraminifera

JUAN XU[1], SHOUYE YANG[2] AND CHENGFAN YANG[2]

[1]State Key Laboratory of Marine Geology, Tongji University, Shanghai, China

[2]Tongji University

Presenting Author: juanxu@tongji.edu.cn

Element and isotope composition of foraminiferal shells are potentially valuable paleo-proxy for paleoceanography research. However, the standard hand-on batch method for elemental and isotopic analysis often results in substantial loss of sample, as well as contamination by secondary calcite and clay, thus biasing the data toward a more variable and anomalous result. These potentially significant sources of error can be overcome with a flow-through time-resolved (FT-TRA) sequential leaching method that makes time- and labor-intensive pretreatments unnecessary. In this study, we developed an accessible, multi-faced FT-TRA module which allows a wide variety of applications can be developed, by customizing key system parameters such as sample cell types. It also offers the choice between on-line analysis or fraction collection for off-line. Also, a kit suite for online addition of internal standards is adopted to improve the accuracy and precision. In addition, a specialized software for FT-TRA data was developed to improve efficiency. To verify the reliability and accuracy of our FT-TRA system, systematic analysis was carried out, including dissolution of foraminifera and standard sample GSR-6 (argillaceous limestone). The result of GSR-6 showed that the reproducibility of Mg/Ca was better than 6 % (1 RSD, n=3), and Sr/Ca was better than 2.1 % (1 RSD, n=3). Moreover, four foraminifera from the same sample were analyzed respectively, and the result showed that the reproducibility of Mg/Ca was better than 8.3 % (1 RSD, n=4), and Sr/Ca was better than 2.9 % (1 RSD, n=4). Furthermore, with gradually increasing and highly regulated acid strength, FT-TRA reliably separated the biogenic calcite (the desire signal) and clay (a contaminant contains Al). The results of the foraminifera also show that FT-TRA technology is highly sensitive, and Mg/Ca, Sr/Ca and Mn/Ca can be obtained with a single foraminiferal shell. However, for rare earth elements and U, the results suggest that larger sample sizes are needed to enhance precision and retrieve reliable results.

Haley, B.A., Klinkhammer, G.P., 2002. Chemical Geology, 185(1-2): 51-69.

Benway, H.M., et al., 2003. Geochemistry Geophysics Geosystems, 4.

Klinkhammer, G.P., et al., 2004. Paleoceanography, 9(4).