

## **Geochemistry of metastable phases of calcium carbonate and their relationship with biogenic carbonates**

ALEKSEY YU. SADEKOV<sup>1</sup>, RINAT V. GABITOV<sup>2</sup>, THOMAS DECARLO<sup>1</sup>, MALCOLM McCULLOCH<sup>1</sup>

<sup>1</sup> School of Earth Sciences, University of Western Australia

<sup>2</sup> Department of Geosciences, Mississippi State University

Majority of paleoclimate proxies are based on the relationship between the geochemistry of marine calcifiers and the environmental parameters in which they form. For example, Mg/Ca or Sr/Ca values of foraminifera/corals is widely employed to reconstruct past seawater temperatures. However, fractionation coefficients of trace metals into biogenic carbonates are significantly different from their inorganic analogues and the term of 'vital effect' is commonly used to explain these disparities.

Recently, several studies indicated that marine calcifiers produce their skeletons using non-classical pathways where the stable phase, for example, calcite, is preceded by an amorphous precursor or less stable phase, such as vaterite or high-Mg calcite (*Jacob et al, 2017; Mass at al, 2017*). These precursors are likely to have different fractionation coefficients than the final/stable phases of biominerals.

In this work, we present fractionation coefficients for Li, B, Mg, Sr into metastable phases formed from natural seawater under different saturation states of calcium carbonate. Using in-situ Raman Spectroscopy we document the transformation of metastable phases over time frames from few seconds to few months. Results of these experiments will be discussed in the framework with current biomineralisation models for foraminifera and corals to show that 'vital effect' in biomineralisation is largely overestimated.

Jacob et al. (2017) *Nature Communications* 8, 1265;  
Mass at al, (2017) *PNAS* 11(37).