

Carbonate clumped isotope reordering along the thermal gradient of the Monzoni intrusion aureole in the Dolomites

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Clumped isotopes in carbonates have emerged to be a powerful proxy to determine the formation temperature of the environment in which the minerals formed [1]. However, exposing carbonate minerals to elevated heat and pressures can cause solid-state bond reordering and re-equilibration of the clumped isotope temperature signal [2], [3]. This process of solid state bond reordering within the lattice of carbonate minerals is not well understood because the effect of burial diagenesis and metamorphism on the carbonate clumped isotope composition are impossible to reproduce in laboratory experiments and natural study sites are rare. To better understand the process of solid state reordering of clumped isotopes in carbonates, we studied a profile in the contact metamorphic aureole of the Monte Monzoni intrusion in the Dolomites, Italy. This intrusion was emplaced in flat-lying, previously unmetamorphosed Permo-Triassic sediments, that mainly consist of siliceous calcitic rocks [4]. The temperature distribution in the contact aureole is well constrained from petrological studies and offer a thermal gradient from rocks that were exposed to nearly 800 °C to completely unmetamorphosed limestones [4], [5]. Our study on the clumped isotope composition of carbonate rocks influenced by contact metamorphism provide further insights on the temperature required for solid state reordering and on the so-called apparent equilibrium temperature recorded in the clumped isotope signal of carbonate minerals during cooling. The understanding of solid state reordering is crucial for the interpretation clumped isotope temperatures in ancient sediment rocks that have experienced higher temperatures due to burial diagenesis or heating from contact metamorphism.

[1] Ghosh et al. (2006), *GCA* 70, 1439-1456.

[2] Passey and Henkes, (2012), *EPSL* 351-352, 223-236.

[3] Stolper and Eiler, (2015), *American Journal of Science* 315, 363-411.

[4] Gallien et al. (2007), *Min. Pet.* 91, 25-53.

[5] Ferry et al. (2002), *Contrib Mineral Petrol* 142, 679-699.