



## **What drives dolomitization? A mass transfer study across a replacement front.**

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Dolomitization occurs worldwide and can create geobodies of several hundreds of cubic meters that represent an important unconventional reservoir with ore deposits (MVT), hydrocarbons and carbon sequestration. Unfortunately, it is difficult to explain the large volume of dolomite present on earth based on the relatively low solubility of Mg in water.

To better understand how a dolomitization front propagates through carbonates, it is fundamental to study a natural interface between an unreacted carbonate and a dolomite body. Across the interface and based on the respective composition of each phase present, the local density and volume of the solid can change significantly compared to the original calcite. In function of how the system is opened to mass transfer and how the volume of the solid changes during the replacement, porosity or fractures can be generated.

We present here an analytical study of a reactional interface between a limestone and a dolomite in the Bearnese Chains (Pyrenees, France). Results show how the volume fraction, phase redistribution, density-volume-mass variation and local bulk composition evolve across the interface using quantitative X-Ray mapping with an electron probe microanalyzer (EPMA) and the software XMapTools V. 2.4.3 (Lanari et al. 2014), coupled with a mass balance equation (Gresens 1967). Modelling of phase equilibria has also been used to estimate the range of pressure and temperature where this reaction takes place and has been compared to independent temperature estimations obtained from fluid inclusion microthermometry. This result leads us to constrain P-T conditions of dolomitization in order to better refine diagenetic models. Analytical results suggest a close relationship between stress-strain, volume and mass transfer redistribution within the reaction interface.

Gresens, R. L. (1967): Composition-volume relationships of metasomatism. In *Chemical Geology* 2, pp. 47–65. DOI: 10.1016/0009-2541(67)90004-6.

Lanari, P.; Vidal, O.; Andrade, V.; Dubacq, B.; Lewin, E.; Grosch, E. G.; Schwartz, S. (2014): XMapTools: A MATLAB<sup>®</sup>-based program for electron microprobe X-ray image processing and geothermobarometry. In *Computers & Geosciences* 62, pp. 227–240. DOI: 10.1016/j.cageo.2013.08.010.