Massive Hydrothermal Dolomites in the Cantabrian Zone (NW Spain) and Their Relation to the Late Variscan Geodynamic Setting

Thilo Bechstadt[1], Maria Boni[2, 1], Marta Gasparrini[1], and Fabio Lapponi[1]
1 Geologisch-Palaontologisches Institut, Universitaet Heidelberg, INF 234, D 69120 Heidelberg, Germany; bechstaedt@uni-hd.de
2 Dipartimento Scienze della Terra, Univ. Napoli, Via Mezzocannone 8, 80134 Napoli, Italy

Large-scale, massive burial dolomitization affected the Carboniferous and Cambrian carbonate succession of the Cantabrian Zone (Asturia, Cantabria and Leon Provinces, NW Spain). These dolomites are excellently exposed and represent an important outcrop analogue for hydrocarbon reservoirs elsewhere. The dolomitization is discontinuous and irregular but has a remarkable spatial distribution in different tectonic units of the area. Dolomitization has no relation to local early diagenetic dolomitization. Replacive and void-filling dolomites formed and were often post-dated by calcite cementation. Each dolomite type is characterized by an ample range in $?^{18}O$, on a regional scale, and by more constant $?^{13}C$, buffered by the carbon signature of the precursor limestone. The $^{87}Sr/^{86}Sr$ ratios are slightly but constantly more radiogenic than Cambrian or Carboniferous seawater values. The minor element composition (Sr, Na, Fe, Mn) is consistent with a burial origin of the dolomite. Fluid inclusion studies give more insight into the composition of the dolomitizing fluids. The low melting temperature of ice in fluid inclusions points to highly saline brines characterized by the presence of different cation species. Low temperature Raman spectroscopy confirmed the presence of hydrohalite and al least one other salt-hydrate phase. The halogen ratios are consistent with basinal brines derived from evaporated seawater, which has been modified through water/rock interaction. A regional, longlasting fluid flow can be hypothesized, affecting the Cantabrian Zone. The dolomites probably formed in Early Permian time during post-thrusting orocline formation in an extensional setting. Lithospheric delamination enabled increased heat flow and thermal convection of the fluids.

Keywords: Hydrothermal dolomites, reservoir analogs, Paleozoic, Spain