Abstract

Late diagenesis of limestones through high temperature dolomitization is widespread in buried platform carbonates and sometimes associated with base metal deposits. The process remains enigmatic, and many models lack the predictive power to explain why some basins are well endowed and others barren. Situated in the Cantabrian zone (NW Spain), the Picos de Europa Formation (PEF) contains excellent examples of dolomitized platform carbonates which host Palaeozoic Mississippi Valley Type (MVT) Zn-Pb deposits. By sampling two perpendicular transects containing such MVT deposits and associated dolostones, we collect data in a well constrained spatial framework and evaluate the relationship between PEF limestone, dolostones and mineralization from outcrop to thin-section scale. We use detailed petrographic descriptions and cathodoluminescence study on selected samples of the Fuente Dé mining district to characterise the conditions of entrapment and dolomitizing fluids. We estimate trapping temperatures and salinity from primary and pseudo-secondary FI in spatially distributed dolomitized samples, and measure major and trace element distribution along transects using XRF spectrometry. Homogenisation temperatures (T_H) and calculated trapping temperatures (T_T) are found to range 100-170°C for an assumed hydrostatic regime and range 126-225°C in the lithostatic regime, with depths of entrapment ranging 3-6km. T_H increase with increasing body thickness and proximity to the mineralization core. Salinities of the H_2O-$NaCl$-$CaCl_2$ fluids fall in two groups: moderate salinities ranging 8-10wt% $NaCl$ equivalent and higher salinities ranging 18-23wt% $NaCl$ equivalent. Evidence available indicates a population of FI may have experienced some refill with lower salinity, late diagenetic fluids. Thin section CL evidence and fluid inclusion data show dolomitizing fluids are evolved basinal brines which also transported Pb and Zn as pulses before peak burial. The dolomitization process inferred is hydrothermal *sensu* Machel (2004) and mixing of a sulphur-bearing fluid with the metal rich brine likely led to open-growth mineralization along previous dissolution features.

Table 1: List of abbreviations

CL	**C**athodo**L**uminescence
MMR	**M**ajor **M**ud**R**ock
MVT	**M**ississippi **V**alley **T**ype
PEF	**P**icos de **E**uropa **F**ormation
PPL	**P**lane **P**olarized **L**ight
T_{ice}	Final **I**ce melting **T**emperature
T_H	**H**omogenisation **T**emperature
T_T	**T**rapping **T**emperature
TMR	**T**race **M**ud **R**ock