







## Geothermometry and fluid mixing in an English palaeohydrothermal system



Mississippi Valley Type Pb-Zn mineralisation usually occurs as strata bound formations with low temperature deposition of sulfide minerals, commonly in association with fluorite. calcite and dolomite gangue phases from low temperature (T < 150 degrees C) hydrothermal fluids. The source of, fluxes, water-rock ratios and transport paths of the fluids are often not well understood. In the Peak District MVT type mineralisation also occurs in association with karst like features that are thought to have been formed at depth (>1km) as a result of mixing of deep basinal brines and local groundwater during the Triassic period. Using clumped isotope thermometry it is possible to (i) determine the temperature of precipitation of calcite in a wide variety of veins and (ii) using this temperature and the oxygen isotope composition of the calcite determine the isotopic composition of the precipitating fluid.

Samples from Ecton and Temple Mines in Derbyshire record temperatures in the range 20 to 30 degrees C with fluid compositions ranging from meteoric to marine in composition and plot on a well-defined mixing line suggesting that precipitation occurred in a fluid mixing zone between a basinal brine and groundwater at shallow depth (1-2km). Maximum temperatures of 70 degrees C are in good agreement with suggested maximum modelled temperatures of possible source rocks in adjacent basins during Triassic times.

(Data courtesy of Paul Dennis, Stuart Vinen and Alexandra Forman, SIL, UEA)



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