CO_2 release from retrograde ophicarbonate and formation of listvenite (SW Tianshan, China): insight into mobility of COH fluids during exhumation in subduction zones

WEIGANG PENG AND LIFEI ZHANG*

Key Laboratory of Orogenic Belts and Crustal Evolution, SESS, Peking University, China (*correspondence: Lfzhang@pku.edu.cn)

Generation of COH fluids from subducting slabs and their mobility or precipitation during prograde stage have been discussed for several years while the behavior of carbonic fluids during exhumation is widely neglected. Here we show petrological and geochemical evidences for carbonated serpentinite (ophicarbonate & listvenite) from SW Tianshan (China) HP-UHP metamorphic belt to investigate the mobility and transfer of CO_2-bearing fluids during exhumation.

Dolomite pseudomorph after dissolution and decarbonation reaction as *dolomite* + $SiO_2(aq)$ + H_2O → *antigorite* + *brucite* + *calcite* + CO_2 could be recognized in retrograde HP ophidolomite. P-T conditions for this reaction were constrained as $P \leq 5.5$ kbar and T=320~420 ℃ based on phase equilibrium modeling, in well consistent with the pressure and temperature required for listvenite. Similarly, C, O isotopes for carbonates and whole-rock Sr isotopes also confirmed that COH fluids derived from retrograde ophidolomite are responsible for the formation of listvenite. Evidences above suggest that decarbonation reactions and induced mobility of carbonic fluids could pervasively occur during exhumation.

In addition, listvenites from SW Tianshan (China) give an average of ~30 wt% CO_2 (n = 11), implying per 1 m^3 of precursor rock (e.g., serpentinite) could sequestrate ~0.87 t CO_2, which may offer a promising approach for CO_2 storage.