T52A-08 - Amphibolization of the Tso Morari UHP eclogites: a record of fluid infiltration at amphibolite-facies during uplift in the subduction channel

Friday, 17 December 2021
11:25 - 11:30
Convention Center - Room 353-355 (Third)

Abstract

Ultra-high pressure (UHP) metamorphism of the Tso Morari coesite-eclogite during burial in NW Himalaya has been intensively studied over the past several decades. However, amphibolite-facies metamorphism and accompanying metasomatism occurring at lower-crustal depths in the Tso Morari terrane are less well-constrained. In this study, we characterize the eclogite amphibolization and related metasomatic fluids by systematically sampling and analyzing the eclogites at the core of an eclogite boudin and the amphiblolized eclogite (amphibolite) at the rim. Integrated techniques including modal mineralogy, mineral chemistry, whole-rock geochemistry, Mössbauer spectroscopy, and thermodynamic modelling are used to constrain the fluid-induced eclogite amphibolization and associated fluid behaviors. Petrographic observations show that infiltration of an external fluid caused complete amphibolite-facies overprinting of the eclogites at the boudin rim. This is recorded petrographically as increased modal proportions of amphibole, biotite, epidote, plagioclase, and calcite in the amphibolites. The infiltrating fluid caused increased K_2O and CO_2 concentrations and higher bulk-rock $Fe^{3+}/\Sigma Fe$ ratio for the amphibolites, as well as increased LILE (e.g., K, Rb, Cs, Sr, Ba) and ratios of Ba/Rb and Cs/Rb. Phase equilibria modelling using *P–T–M*(H_2O) pseudosections on the amphibolite and the surrounding gneiss indicate that the fluid infiltration occurred at 9.0–12.5 kbar and ~608 °C with >2.6–3.1 mol % H_2O infiltration. The abrupt increase of bulk-rock $Fe^{3+}/\Sigma Fe$ ratio from 0.192 to 0.395 near the boudin rim indicate that this phase of fluid most likely derived from the mixing of dehydrated host orthogneiss and/or metasediments during uplift at the amphibolite-facies zone in the subduction channel. This study also demonstrates the need for using careful petrographic observations and geochemical analysis in parallel with thermodynamic modelling to achieve realistic results.

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