Petrological characterization and tectonic implications of multi-stage garnet crystallization in eclogitic rocks from the southern Tongbai region

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We report some newly-discovered eclogitic rocks within the blueschist-greenschist unit in the southern Tongbai region, central-eastern China. This region is the NW extension of the Dabie-Hongan UHP orogenic belt. No UHP rock or true eclogite has been reported from this unit yet. The studied eclogitic rocks occur as discontinuous boudins or pods enclosed within dolomite-bearing marble. The eclogitic rocks contain mainly garnet, quartz, omphacite (Jd33-43), amphiboles, carbonates, and accessory minerals. The rock is heterogeneous in terms of mineral mode and texture.

Three textural types of garnet have been distinguished: Type I is the largest in grain size and with abundant inclusions; Type II is the medium-size and with an inclusion-free core and inclusion-rich rim; Type III is the smallest and relatively more euhedral. On the basis of chemical zoning of Type I garnet and distribution of inclusions, two stages (core and rim) of garnet crystallization have been identified. Major element compositions show that the rim part is Ca-enriched, but Fe- and Mg-depleted, relative to the core part. The core-rim chemical boundary is sharp, and in some cases, it shows an indication of resorption. Inclusions in the core of the Type I garnet imply an early greenschist-facies stage, whereas those in the rim indicate an epidote-amphibolite to eclogite-facies stage.

The eclogite-facies assemblage includes garnet + omphacite + rutile + quartz + carbonate. Glaucophane in the matrix indicates a blueschist-facies stage postdating eclogite-facies. One unique feature of the eclogitic rock is the abundant titanite rods (lamellae or needle-like) across or within garnet grains. The host rock marble shows no evidence of high-pressure metamorphism. Thus the rock association may represent a tectonic mixture. In summary, the Tongbai eclogitic rocks in the blueschist-greenschist unit record part of a subduction history that was not previously recognized.

Crystalchemical aspects and polymorphism in post-perovskite

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We synthesized post-perovskite phases of aluminous and ferrous-aluminous magnesiummetasilicate. Diffraction patterns and Raman spectra indicate marked structural deviations from the calculated $CaIrO_3$-type structure of post-perovskite. Combined modelling of alternative post-perovskite structures based on sets of crystallite reflections spanning a reciprocal space lattice and on ab-initio calculations show our data to be consistent with postperovskite structures composed of kinked MgO- and SiO_2-layers that have previously been proposed by Oganov, A.R. *et al*. (2005) *Nature* **438**, 1142-1144. The transition to perovskite has been reversed in our experiments. These new phases appear to be intermittent between perovskite- and $CaIrO_3$-type silicate. Kink density may correlate with chemical parameters and has a significant effect on the perovskite-kinked ppv phase boundary. Hence, the paragenesis of deepest mantle rock may be markedly different for depleted mantle and eventual enriched or primitive reservoirs.

Acknowledgements

This work was supported through the NNSA Cooperative Agreement DE-FC88-01NV14049. Use of the HPCAT facility was supported by DOE-BES, DOE-NNSA, NSF, DOD - TACOM, and the W.M. Keck Foundation. APS is supported by DOE-BES under Contract No. W-31-109-Eng-38.