

Lawsonite-bearing eclogitic rocks (metabasites) in the north Qilian and north Altyn Tagh, north Tibet: evidences for cold subduction of oceanic crust

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Abstract:

Lawsonite is an important HP/UHP hydrous mineral that forms along a cold geothermal gradient. Laboratory experiments and thermal models predict that lawsonite-bearing eclogite should be the dominant rock types for typical oceanic subduction zone. However, eclogite (or eclogitic rock) containing unaltered lawsonite is rare in nature and has been described only from a few localities. Based on petrography and mineral chemistry, lawsonite-bearing eclogitic rocks are recognized respectively in the North Qilian (NQL) and north Altyn Tagh (NAT), northwestern China. In investigated samples, lawsonite coexists with omphacite and phengite as inclusion in garnet, indicating eclogite facies conditions during garnet growth. Peak pressure conditions estimated from lawsonite-omphacite-phengite-garnet assemblages were 2.1-2.4 GPa at temperature of 420-500 °C, being in the stability field of lawsonite eclogite facies, and implying formation under a geotherm of 6-8°C/km. These low values are consistent with metamorphism in a cold subduction. The occurrences of lawsonite-bearing eclogitic rocks in both NQL and NAT provide a new constraint on the suggestion which the NAT HP/LT metamorphic belt is the northwestward extension of the NQL HP/LT metamorphic belt, formed by early Paleozoic subduction and collision of the Qilian and Alashan blocks, and subsequently offset by left-lateral slip on the Altyn Tagh fault.