Mineral chemistry, P-T and tectonometamorphic evolutions of garnet amphibolites from the Takht-e-Soleyman, NW Takab

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Abstract: The Takht-e-Soleyman complex is formed from various rock types including metapelites, metabasites and marbles which are metamorphosed under green schist through amphibolite to granulite facies. The amphibolites have been melted partially under high temperatures and mafic migmatites are formed in this regard. The pick metamorphic minerals of garnet amphibolites have been completely replaced by the low temperature plagioclase-hornblende symplectite. So, the pick metamorphic P-T conditions of these rocks (M_1) have not been recognized due to the lack of proper mineral assemblage and chemistry of phases. The retrograde P-T conditions (M_2) have been determined on the basis of textural evidence, equilibrium mineral assemblage and mineral chemistry as two stages: (1) the retrograde metamorphism as strong decreasing of pressure (M_{2,a}) and (2) cooling and decompression stage during exhumation of the rocks (M_{2,b}). The temperature and pressure conditions during M_{2,a} and M_{2,b} have been obtained as 650°C-700°C at 7-8 kbar and 510°C-570°C at 5.5-6 kbar, respectively. Considering textural evidence, mineral assemblage, thermobarometry estimations and clockwise retrograde P-T paths of the investigated rocks it can be considered that the first section of P-T path with deep dP/dT sleep indicates strong decreasing of pressure most probably related to thrust faulting resulted from crustal thickening during continental collision, whereas the second part of P-T path has been formed by cooling of the rocks related to crustal thinning and exhumation processes. So the retrograde metamorphism and exhumation of the Takht-e-Soleyman garnet amphibolites is consistent with the crustal thickening and its subsequent thinning due to compressions and extensions related to the Laramid orogenic phase during closing of Neotethys.

Keywords: garnet amphibolite; mineral chemistry; thermobarometry; tectono-metamorphic evolutions; Takht-e-Soleyman; NW Iran.