

Metamorphism of the Shotur Complex, Central Iran

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The Razveh area with the Shotur Kuh Metamorphic Complex is part of the Central Iranian terrane and it is situated about 120 km SE from Shahrud (Semnan province, NE of Iran). It represents an E-W trending elliptical tectonic window (ca 20 km long and 11 km wide) exposed beneath the late Paleozoic and Mesozoic sediments near the Torud village. Similar to other crystalline windows, exposed beneath the Paleozoic to Mesozoic sedimentary, it has been assumed to represent a Pre-Cambrian metamorphic basement unit. However, detailed petrology and geochronology of the rocks (laser ablation ICP-MS on zircon) indicated igneous origin for their protholite of early Cambrian age (519 ± 18 Ma and 547 ± 7 Ma). The main rocks are orthogneiss of tonalite, granodiorite, monzogranite and granite composition with various amounts of amphibolites (probably former dykes and xenoliths). Metamorphic mineral assemblages of the rocks are very simple: plagioclase, biotite and quartz K-feldspar garnet in the orthogneisses and plagioclase and hornblende garnet in amphibolite. Allanite with epidote rims is a common accessory phase in the orthogneisses. Kyanite associated with gedrite was found in Al-rich variety of amphibolite. Garnet, both in orthogneisses and in amphibolite, shows prograde zoning. Metamorphic PT conditions obtained using conventional thermobarometry for garnet-bearing orthogneisses range between 550-660 °C and 6.8-7.6 kbar for orthogneisses. Relatively higher pressures of 10-12 kbar were obtained for garnet-bearing amphibolite. The results of pseudosection with isopleths of garnet indicate 7 kbar/600 °C for core composition and 8.5 kbar 650 °C for rim composition of garnet. These PT conditions are confirmed by all three isopleths of X_{Ca} , X_{Fe} and X_{Mn} . Timing of amphibolite facies metamorphism, prior to middle Jurassic, is confirmed by pebbles in the overlying conglomerate. Lower Jurassic to Upper Triassic age for amphibolite facies metamorphism is inferred based on preliminary age dating of muscovite (170 Ma, Ar-Ar), biotite and muscovite (208.7 ± 3.2 Ma, K-Ar) and of monazite (180 Ma, ICPMS). The rocks are strongly retrogressed and overprinted by lower greenschist facies metamorphism. The sedimentary rocks of Middle Jurassic age show very low degree of metamorphism.

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