

Rutile-bearing quartz and hematite-bearing quartz from ultrahigh-temperature granulite facies terrain in southern India

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We report the occurrence of spectacular oriented needles of rutile and hematite within quartz veins and pods in granulite facies rocks that have undergone partial melting at ultrahigh-temperature (UHT) metamorphic condition in the Karur region, southern India [1]. Laser Raman spectroscopy and electron microprobe analysis confirm that (1) one of the mineral inclusions within quartz is pure rutile, and (2) a second category of quartz contains pure hematite inclusions. The rutile never coexists with the hematite inside the same quartz specimens, which were described in this study. Fluid inclusions in the quartz are characterized as CO₂ + H₂O mixture. Application of experimental thermometer [2] and empirical thermometer [3] utilizing Ti in quartz gives us the minimum estimate of 1194 degree-C, which suggests the formation of the rutile-bearing quartz under UHT metamorphic condition. One of the possible sources for the Ti in quartz could be biotite that is one of common accessories in most granulite facies rocks. Sato et al. [4] performed high-pressure and high-temperature experiment using natural F-phlogopite-bearing UHT granulite. As a result, they demonstrated that F-phlogopite [F/(F+OH) = 0.46] is unstable at 9 kbar and 1200 degree-C and the Ti released from phlogopite enters the melt phase at this P-T condition. The minimum temperature estimate of 1194 degree-C obtained from the Ti-thermometers supports the assumption that the biotite breakdown, release of Ti into the melt phase and concentration of large rutile needles within quartz segregations were related to UHT metamorphism in the Karur region.

References: [1] Santosh and Sajeew (2006) *Lithos*, 92, 447-464. [2] Wark and Watson (2006) *Contrib. Mineral. Petrol.*, 152, 743-754. [3] Kawasaki and Osanai (in review) in: *Geodynamics evolution of East Antarctica: A key to the East-West Gondwana connection* (Satish-Kumar, Motoyoshi, Osanai, Hiroi and Shiraishi, editors). *Spec. Publ., Geol. Soc. London*. [4] Sato, Miyamoto and Kawasaki (2004) *Jour. Mineral. Petrol. Sci.*, 99, 191-201.