

Petrographical Evidence for Ultra High Temperature (UHT) Metamorphism of Pelitic and Mafic Rocks from the Central Highland Complex, Sri Lanka

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Abstract: Ultra High Temperature (UHT) metamorphism, with temperature >900°C, has been proposed and documented in very restricted localities in the Highland Complex (HC) – Sri Lanka. We have started fresh sampling of Al and Mg rich pelitic rocks (esp. sillimanite (sil), staurolite, sapphirine (Spr), spinel (Spl) and corundum bearing) and essentially garnet (Grt) and clinopyroxene (Cpx) bearing mafic rocks from localities in the HC, in order to reconcile the spatial and temporal evolutionary path of the UHT metamorphism. In this study we put forward our field and petrographic observations at three sampling locations at Kotmale Ampitiya and Talatuoya in the central Sri Lanka. Spr and Spl are found as closely associated rare inclusions in the core and mantle areas of porphyroblastic Grt. This thin layered pelitic rock close to Kotmale reservoir contains Grt, orthopyroxene (Opx), Biotite (Bt) and Sil. There is no co-existence of Spr and Spl was observed. Instead, there is clear evidence showing some Spr and Spl independently co-existing with a mineral which is too tiny to be optically identified. This unidentifiable mineral may be quartz (Qtz) and/or Plagioclase (Plag). Fine to medium Sil needles could be found as inclusions within the mantle area of Grt. Dry mafic rocks, at Ampitiya occur as blocks within marble while as lenses within quartzo-feldspathic granulite at Talatuoya. Rocks at both localities contain Grt, Cpx, Opx, Plag, Qtz and iron ore together with plenty of textural features indicating multistage P-T evolution. Co-existing Cpx-Plag and isolated Qtz inclusions within Grt imply that Grt formation may have taken place via reaction $Cpx + Plag_1 = Grt + Plag_2 + Qtz$. Plag moat around Cpx occur as inclusions within the rim area of Grt may indicate early decompression event. Cpx and Plag inclusions towards the margin of same Grt indicate that further growth of Grt followed early decompression event. Existence of Grt+Cpx+Qtz as the peak metamorphic assemblage indicates UHT conditions, which can be inferred based on abundant occurrence of Opx and Plag symplectite and moat in rocks at Ampitiya and moats in rocks at Talatuoya. Therefore, these Sap bearing pelitic granulites and Grt-Cpx-Qtz bearing mafic granulites bear rare but important evidence to support UHT metamorphism in the HC of Sri Lanka.

Keywords: Highland Complex, Sri Lanka, Sapphirine, UHT metamorphism