

## Ultrahigh-temperature metamorphism of Mg-Al rocks from Vellapatti in the northern Madurai Block, southern India

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The southern Indian granulite terrane is characterized by the widespread occurrence of Pan-African granulite-facies rocks that underwent Pan-African ultrahigh-temperature (UHT) metamorphism. Previous petrological studies on the rocks from the Madurai Block (MGB) suggest the peak metamorphic conditions of 900-1000 °C and 8-12 kbar, which is consistent with occurrences of diagnostic UHT mineral assemblages such as sapphirine + quartz, spinel + quartz, and orthopyroxene + sillimanite + quartz (e.g., Tateishi et al., 2004; Morimoto et al., 2004; Tadokoro et al., 2007). In this study, we report Mg-Al rocks from a new locality, Vellapatti, in the northern Madurai block, and discuss their petrological implications and peak metamorphic conditions.

The sample of phlogopite-sapphirine gneiss from Vellapatti area comprises phlogopite, sapphirine, spinel and rutile. Phlogopite is coarse grained and euhedral, and occurs as the most dominant mineral of the rock. Spinel is Mg rich ( $X_{Mg} = \text{Mg}/[\text{Fe}+\text{Mg}] = 0.91-0.93$ ) and Zn and  $\text{Fe}^{3+}$  poor (ZnO equal to or less than 0.05 wt. %,  $X_{Zn} = \text{Zn}/[\text{Fe} + \text{Mg} + \text{Zn}]$  equal to or less than 0.001,  $\text{Fe}^{3+}/[\text{Fe}^{2+} + \text{Fe}^{3+}] = 0.072-0.087$ ). Sapphirine (Si = 1.66-1.72 pfu) is extremely Mg and  $\text{Fe}^{3+}$  rich ( $X_{Mg} = 0.97-0.99$ ,  $\text{Fe}^{3+}/[\text{Fe}^{2+} + \text{Fe}^{3+}] = 0.63-0.86$ ), which has not so far been reported from this area.

The metamorphic temperature conditions of the phlogopite-sapphirine gneiss was estimated using sapphirine-spinel geothermometer of Owen and Greenough (1991). The results yielded a very high-temperature condition of 880-1040 °C which probably corresponds to a near-peak condition. The condition is nearly consistent with the results of recent P-T studies from the MGB (T = ca. 1000 °C; e.g., Tateishi et al., 2004; Tsunogae and Santosh, 2006). Our results therefore confirm the Madurai block underwent widespread UHT metamorphism which is probably associated with the Neoproterozoic orogeny attending the final amalgamation of the Gondwana supercontinent.