

Geochemistry of Paleoproterozoic TTGs and Neoproterozoic high-K granites around Chitradurga, western Dharwar Craton, India

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The western Dharwar Craton (WDC) mainly comprises TTG-type peninsular gneiss, greenstone belts, and high-potassium granites (e.g. Chadwick et al., 2000; Jayananda et al., 2013). The TTGs are widely distributed in the WDC as 3.4-3.2 Ga basement rock and occasionally contain more elder sediments and volcanics (i.e. the Sargur Group) (e.g., Peucat et al., 1993). The greenstone belts, named the Bababudan and the Chitradurga Group, unconformably overlies the TTGs as 2.9-2.6 Ga sedimentary covers (Hokada et al., 2013), consisting mainly of conglomerate/quartzite, BIFs, and mafic to felsic volcanics (e.g. Chadwick et al., 1981). The high-potassium granites crop out as several isolated intrusions in both the TTGs and the greenstone belts. The intrusive ages of the granites are mostly around 2.61 Ga (e.g. Jayananda et al., 2006). The aim of this paper is to make clear the petrographic and geochemical characteristics of the Paleoproterozoic TTGs and the Neoproterozoic high-potassium granites around Chitradurga in the WDC, southern India.

The TTGs are largely grouped into two types; K-feldspar (Kfs)-poor meta-trondhjemite and K-feldspar-rich meta-granite. The Kfs-poor meta-trondhjemite has petrographic and geochemical features of slab-derived TTGs. On the other hand, the Kfs-rich meta-granite contains abundant K-feldspar, a mineral phase that is not common in the TTGs. Additionally, the meta-granite shows different geochemical characteristics than that of TTGs. In particular, their Al₂O₃ and Sr contents are not enriched, and their K₂O/Na₂O ratios are higher, which look like continental type of TTGs. These features of rocks suggest that the Kfs-poor meta-trondhjemite are derived from oceanic crust melting, whereas the Kfs-rich meta-granite are derived from the re-melting of crustal materials. In Paleoproterozoic western Dharwar Craton, many slab-derived TTGs had intruded in to the crust. In addition, it is probable that the crustal recycling has already started.

The Neoproterozoic high-potassium granites around Chitradurga area are divided into three intrusions; Chitradurga granite, Hosdurga granite, and Jampalnaikankote granite (Jayananda et al., 2006). We revealed that they have different petrographic and geochemical features each other. The Chitradurga granite is a massive and coarse-grained. The Hosdurga granite is characterized by mylonitic foliation and consists of pinkish medium-grained rocks. The Jampalnaikankote granite is essentially including hornblende and is locally associated with gabbroic rocks. Chitradurga and Hosdurga granites can be geochemically classified into within-plate type granites, whereas the Jampalnaikankote granite is possibly of volcanic-arc origin. This suggests that the high-potassium granites are derived from different sources implying that the Neoproterozoic western Dharwar crust maybe composed of heterogeneous materials including volcanic arcs and matured continents. Based on detailed geochemical, we discuss the magmatic evolution and origin of the Paleo- to Neoproterozoic plutonic activity in the western Dharwar Craton.

References:

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