CONCLUSIONS

Inferences drawn, based on the present study and to some extent on the ongoing studies related to other rock types in the Kolar area, are summarised below:

The sources for the Kolar komatiitic rocks were depleted in LREE well before 3.9 b.y. These sources were metasomatised shortly before melting around 2.9 b.y. The metasomatic material although enriched in LREE and incompatible elements, had high +ENd values. Such intrusions from relatively deeper to shallower levels have also enriched the overlying mantle, the sources for Kolar komatiitic rocks, in Fe, Ti and, perhaps in Al also. Similar changes in the bulk composition are found to be common in the metasomatised parts of the mantle (Willshire 1984).

Thus, the change in the bulk composition of the mantle, towards Fe-rich side, and introduction of fluids during metasomatism would have lowered the solidus considerably. The intrusion of the high P (and therefore high T) melts, derived from much depleted lower mantle, into the overlying mantle sources would have supplied also heat energy required to
initiate melting. The heated up source, because lighter than the surrounding mantle, started moving upwards and thus the melting proceeded adiabatically. The melt was removed continuously, as the melting proceeded. Because of latent heat of fusion and loss of heat to the surroundings, after certain extents of melting, diapiric uprise and melting were ceased. Perhaps the komatiitic rocks of the Kolar could have been generated from several such diapirs at depths around 150 km in the mantle (50 Kbars).

The present study and the previous study of Rajamani et al. (1985) indicate that the komatiitic rocks from the eastern and western parts of the belt have come from distinctly different sources. The field evidence, geochemical and isotopic characteristics of the western komatiitic rocks suggest that they were formed under deep submarine conditions and their sources were similar to that of MORB. Perhaps these rocks were emplaced as flows or shallow sills at the spreading ridges. The eastern komatiitic rocks show geochemical characteristics analogous to island arc basalts. The Nd isotopic data and certain geochemical features on these rocks indicate that their melts could have undergone crustal contamination. These rocks
have much lower Ni contents for given MgO contents, compared to other komatiitic rocks. Crustal contamination of their melts could have depleted their Ni contents. This is because crustal contamination and selective assimilation would have favoured immiscible sulphide magma to segregate, to which Ni has a very strong affinity (Rajamani and Naldrett 1978, Naldrett 1981, Campbell et al. 1983). Thus the source characteristics and the evidence of contaminations in the melt representing eastern komatiitic rocks suggest, they could have been derived in island arc environment.

The Archean oceanic lithosphere is thought to be 'richer' in komatiitic rocks. Therefore, the density of the oceanic crust was equal to or greater than underlying mantle (Arndt 1983). In Kolar we have inferred an oceanic basement for the western komatiitic rocks. Whether the conditions proposed for Archean oceanic crust existed or not in the Kolar region, the emplacement of komatiitic magmas would have been more plausible in the inferred tectonic environment rather than over ensialic crust.

For the mantle melting conditions, gold behaves like an incompatible element (Rajamani 1982). Therefore, during metasomatism, the mantle sources would be
enriched in Au also, along with other incompatible elements. Low per cent melts, generated from these deeper mantle sources would have at least an order of magnitude higher Au concentration relative to the source. The Kolar komatiitic rocks derived from metasomatised mantle by low extents of melting could have been significantly enriched in the gold (atleast 100X). The eastern komatiitic rocks, enriched in incompatible elements could have had higher primary concentration of gold.

Balakrishnan and Rajamani (1986) based on the geochemical studies on the felsic rocks suggested that Champion Gneisses could have been derived by low extent melting of eastern komatiitic amphibolites at mantle depths. In this process, melts representing Champion Gneisses could have been enriched in Au by several orders of magnitude relative to mantle. They would have supplied Au to the quartz lodes associated with the eastern amphibolites and Champion Gneisses in the Kolar Schist Belt.

The western komatiitic rocks, possibly, could have provided gold to the sulphide lodes. Au from these rocks were thought to be leached by low T fluids, under low Eh and high pH when they were being deposited
under submarine conditions. These inferences regarding the Au mineralization are supported by the petrographic and geochemical studies on the Au lodes of Kolar Schist Belt by N.S. Siddaiah (Siddaiah 1981, 1986, Siddaiah and Rajamani 1984, 1986, Rajamani and Siddaiah 1982). Thus the komatiitic rocks could have acted as carriers of Au from the metasomatized mantle sources to the crust, to be refined by the secondary processes.

The gneisses on the eastern and western side of the belt are suggested to be petrogenetically unrelated and different (Balakrishnan and Rajamani 1986). Preliminary isotopic studies indicate that the western and eastern gneisses were emplaced at totally different periods. Major components of the western gneisses were emplaced at 2610 ± 5 and 2550 ± 10 m.y. whereas the eastern gneisses intruded at 2529 and metamorphosed at 2520 ± 1 (Hanson et al. 1986). Neither the intrusion of the eastern gneisses nor their metamorphism has left any record on the gneisses just 5 km apart. Perhaps the eastern and western gneisses were spatially separated till 2520 m.y. atleast.

If the 2.9 b.y. Sm-Nd isochron on the Kolar komatiitic rocks indicate the time of their formation, it has serious implications on the evolution of crust
in this region. These komatiitic rocks, at least 250 m.y. older, were caught in-between much younger and different continents. There are several schist belts north of Kolar, that are similar in shape and lithology. Inferences drawn for the Kolar Schist Belt, therefore, could be relevant to the Archean tectonics and crustal evolution in the eastern part of the Karnataka greenstone-granite terrain.