

Influence of changes in the Provenance on the Uranium mineralization in the lower Paleoproterozoic Cuddapah Supergroup, Southern India: Geochemical Evidences

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The intracratonic Paleoproterozoic Cuddapah basin initiated ~ 1.9 Ga ago is one of the largest sedimentary basins of India. The lower part of the Cuddapah Supergroup, hosts largest Uranium ore occurrence hosted in stromatolitic dolomites belonging to the Vempalle Formation. In this study, we carried out geochemical analysis on drill core samples of quartzites of the basal Gulcheru Formation underlying the Uranium mineralized zone and the carbonate-rich red shales overlying it. These sedimentary rocks were deposited in fluvial to shelf marine conditions on a rifting cratonic platform.

In the A-CN-K diagram the Gulcheru quartzites as well as the red shales show effect of K-metasomatism. The pre-metasomatic Chemical Index of Alteration (CIA) values of quartzites are moderate ranging from 76 to 81, while the red shales yield very high values of >90 indicating intense chemical weathering of their source.

The REE compositions of the quartzites are similar to the Archean TTG rocks of the Dharwar Craton although the basement rocks that surrounds the Cuddapah basin are dominantly 2.5 Ga granites. REE coupled with Zr/Cr mass balance modeling indicates that the red shales of the Vempalle Formation are derived from a provenance consisting of 20% TTG, 55% Amphibolite, and 25% 2.5 Ga granite. Thus it is apparent that a shift in the provenance took place during the deposition of the Gulcheru Formation to that of the Vempalle Formation. Incidentally, the U-rich stromatolitic dolomites belonging to the Vempalle Formation overlie a conglomeratic horizon that separates them from the underlying Gulcheuru Formation. We suggest that such a shift in the provenance coupled with intense chemical weathering inferred from high CIA values might have supplied Uranium in large quantities to the basin. Further, the Uranium mobilization may be linked to the oxidative weathering following GOE at ~1.9 Ga [1] - the time window during which these dolomites have been deposited.

[1] Kump, L.R. *et al.*, (2011) *Science* **334**, 1694-1696.