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Mesoarchean Uraniferous QPCs from Singhbhum Craton, India: Geochemical Proxies for Supergene Modifications

Joydip Mukhopadhyay and Saheli De
Presidency University, Geology, Kolkata, India (joydip17@gmail.com)

Detrital uraninite bearing QPCs are restricted in pre-GOE Archean rocks (Cuney, 2010). U+4 state in these uraninites is highly unstable in surficial environment even at very low oxygen concentration. Uraniferous QPCs are preserved in strata below supergene profile. Our study from Mesoarchean siliciclastics of the Singhbhum craton India reveals significant variations in mineralogy, major and trace element composition from subsurface and supergene alteration levels. The QPCs from below the weathering profile still preserve detrital uraninite grains (Mukhopadhyay et al., 2016). In contrast the QPCs from the weathering profile mostly contain U in Ti-bearing phases such as brannerite and leucoxene. Uraniferous QPCs from below weathering profile show enrichment of Cr, Ni, Cu, Zn, LREE, Y, U, Th, Pb, depletion or low variation of V, Co, Rb, Ba, Sc, Sr, Cs, Eu anomaly, and flat HREE pattern with respect to non-uraniferous QPCs. Elemental correlation between U-Th with respect to other elements show positive correlation with $Fe2O_3$, Sc, Co, Ni, Y, Ta, Pb and HREE and negative correlation with SiO_2, $Al2O_3$, MgO, MnO, Na2O, K2O, Zr, Hf, Rb, Ga, Cs, Zn and LREE. It is obvious that in surface samples within supergene weathering profile, chance of survival of uraninite is very rare. The correlation of other elements with U and Th indicate positive values with MnO, TiO_2, Zr, Ti, Hf, Sr, Ba and LREE and negative correlation with respect to SiO_2, $Al2O_3$, Na2O, V, Co and Ta. There exists slight negative or no correlation with respect to $Fe2O_3$, K2O, Sc, Cr, Cu, Ga, Y, Nb, Rb, Pb and HREE within QPC samples from supergene profile.
The enrichment of redox elements (Cr, Cu and Ni) and their positive correlation with U-Th clearly point to the reduced nature of the uraniferous QPCs from subsurface beyond the supergene profile. The redox-sensitive trace elements indicate the presence of detrital pyrites.
On the other hand the QPCs from the supergene zone show definite U mobilization and complexation mainly with Ti. Such mobilization may have taken place during diagenesis or during surficial oxidative weathering at low atmospheric oxygen level below the threshold of complete oxidation of U+6 state. A low positive correlation of U with redox sensitive elements (V, Cr, and Cu) may indicate that U- here is not associated with redox sulphides. U also reveals positive correlation with LREEs indicating preferential U-concentration in supergene phosphate phases. The elemental correlations of U with Ti and LREE are likely to suggest that the U-concentration in QPCs took place in the diagenetic to supergene weathering profile through alteration of Ti-bearing phases (Pronto Reaction) and phosphates. Such signature may be important in understanding hidden redox U-paleoplacers below supergene weathering profile.

References

Cuney, M., 2010. Evolution of Uranium Fractionation Processes through Time: Driving the Secular Variation of Uranium Deposit Types. Economic Geology, 105, 553–569.
Mukhopadhyay, J., Mishra, B., Chakrabarti, Kalyan., De, S., and Ghosh, G., 2016. Uraniferous paleoplacers of the Mesoarchean Mahagiri Quartzite, Singhbhum craton, India: Depositional controls, nature and source of >3.0 Ga detrital uraninites. Ore Geology Reviews, 72, 1290-1306.