Na-metasomatism and U mobilization in the Palnad basin, Andhra Pradesh, India: implication for U-transport in Na-zirconosilicate complexes

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Uranium mineralization has often been associated with sodium metasomatism [1]. In the Proterozoic Banganapalle Quartzite in the Palnad basin, uranium mineralization occurs just above the Eparchean unconformity at Koppunuru. Sodium metasomatism accompanying U-mineralization is evidenced by the coarsening of albite lamellae in perthitic K-feldspar as well as by the complete replacement of K-feldspar by albite. Also, widespread sericitization of K-feldspar accounts for some excess of Na that is incorporated into sericite. While the U-mineralization in the Banganapalle Quartzite is practically free from any Th, exclusively Th-bearing phases occur in association with hydrothermally altered zircon and monazite in the basement granitoids implying decoupling of U from Th during the hydrothermal mobilization. High-T experimental evidence shows that such decoupling can take place in case of carbonate or chloride complexation of U as against fluoride complexation in magmatic hydrothermal solutions [2]. From the observation of Na-metasomatism at Koppunuru and room-temperature dissolution experiments on synthetic baddeleyite (ZrO_2), we conclude that considerable dissolution of zircon can occur leading to the formation of Na-zirconosilicate complexes and release of U. Selective incorporation and transport of U rather than Th in such complexes possibly gave rise to the U-mineralization at Koppunuru.

[1] Cuney *et al*. (2012) *Ore Geol. Rev*. **44,** 81–106.
[2] Keppler & Wyllie (1990) *Nature* **348,** 531–533.