Uranium precipitation and fluid composition at Maureen U-Mo-F deposit, Australia

Uranium precipitation and fluid composition at Maureen U-Mo-F deposit, Australia

N.C. HURTIG[1,2], C.A. HEINRICH[1], T. DRIESNER[1], V. WALL[3], I. MATHISON[3] AND W. HERRMANN[3]

[1]ETH Zurich, Department of Earth Sciences, Clausiusstr. 25, 8092 Zurich, Switzerland

[2]Faculty of Science, University of Iceland, 101 Reykjavik, Iceland (*correspondence: hurtig@raunvis.hi.is)

[3]Mega Uranium, c/- Taylor Wall & Associates, Brisbane, QLD 4000, Australia

The expected shortage of petroleum and the growing demand for energy has refuelled the interest in uranium resources and exploitation. Unconformity-related U deposits include the largest high grade U ore bodies world wide. They provide a major and poorly explored low-cost uranium resource. Most deposits are of Proterozoic age. The general formation model comprises mixing of oxidized U bearing fluids with reduced basement-derived fluids at the intersection of the unconformity with deep-rooted faults.

Maureen deposit is the largest of a series of U occurences along the unconformity between the Proterozoic Georgetown Inlier and the Late Palaeozoic Newcastle Range Volcanic Suite in Queensland, Australia. Insights into U transport and precipitation at Maureen are obtained by combining field observation, mineral geochemistry and LA-ICP-MS analysis of fluid inclusions from this young and well-preserved deposit.

The ore forms lenticular bodies preferably along east-west striking steep faults and spreads horizontally on top of basement highs. Devonian quartz conglomerates directly overlying the unconformity are preferentially mineralized. A halo of fluorite, chamosite and dickite surrounds the high grade U and Mo mineralized zones. The ore mineral assemblage comprises an Fe-bearing molybdenum sulfide, arsenian pyrite, arsenopyrite, anatase, goyazite, fluorite, and a sub-μm scale intergrowths of U and Ti oxides.

Reduced mineral assemblages and coexistence trails of intermediate-salinity two-phase fluid inclusions and carbonic vapors indicate interaction of two coeval fluids. Fluid inclusions in fluorite and quartz homogenize at 260 ± 40°C. LA-ICP-MS results from quartz-hosted inclusions show a covariation of U and Mo in the fluid at a 1:10 ratio, indicating U and Mo co-precipitation. Primary low-salinity fluid inclusions hosted by fluorite show U-Mo ratios close to 1, corresponding most closely to the U/Mo ratio in high grade ore and probably representing the parental ore fluid.