Fredericton 2014

Technical Program

SS24: Mineralogy of Plutonic Rocks: From Magmas to Ores. A Tribute in Honour of Andre E. Lalonde (Poster)

Sponsored by / Parrainé par: **MAC / l'AMC**
Organizers / Organisateurs: **Keiko Hattori (keiko.hattori@uottawa.ca), Robert Linnen**
Room / Salle: **Currie Centre**
Presenter: **Erin Adlakha**

High arsenic pyrite associated with the uranium mineralization in the McArthur River deposit, Athabasca Basin, Saskatchewan

Emberley, J., Hattori, K. and Adlakha, E., Department of Earth Sciences, University of Ottawa, Ottawa, ON, jembe038@uottawa.ca

The McArthur River deposit is the largest high grade U deposit in the world. The deposit occurs along the P2 fault near the unconformity between the basement rocks and the Athabasca sandstones. Pyrite is abundant in the basement rocks, especially in graphitic metapelites. The overlying sedimentary rocks contain very minor amounts of pyrite along fractures near the unconformity. Samples were collected from Zone B ore (n=2), metapelites (n=12), pegmatites (n=4) and from sandstones (n=3) along the P2 structure. For comparison, samples far from the ore were also collected such as pelites ~3 km W of the mine. Pyrite in these samples forms fine-disseminations (<0.05 mm), euhedral cubes (<10 mm), isolated grains in clay and monominerallic veinlets and films along late fractures (1-2 mm in width).

Pyrite shows a large range in $\delta^{34}S$; from -30 to +20 ‰ (median=8 ‰, n=10) for disseminated/ euhedral grains in pelites, and from +5 to +40 ‰ (median=10 ‰, n=12) along fractures in pelites. Although the spread is large, the median values are similar. The values close to the ore (< 100 m) are in a narrow range from 0 to +15‰ (median=9 ‰, n=19) which are close the median values for all pyrite. Pyrite in the ore shows an even more restricted range from -1 to + 3‰ (median=1.5‰, n=4), suggesting well mixed source for S and high fluid/rock ratios.

Pyrite far from the mineralization has the stoichiometric composition, whereas pyrite from the ore shows a large compositional variations due to varying concentrations of As (< 4.0 wt%). As-poor pyrite grains are coated and cemented by later As-rich pyrite. As rich pyrite contains ^{206}Pb (<2.0 wt%) indicating that the As rich pyrite formed after uraninite. Contents of As are inversely correlated with those of S, indicating that As is forming AsS dianion in pyrite. It has been known that the U ore contains considerable As, but no As mineral has been found. This study suggests that pyrite is the most likely host of As in the ore. Intragrain compositional variation and zoning of pyrite suggests little recrystallization, if any, after its original deposition.