

Kingston 2017

Technical Program

GE1: Geometallurgy – From Exploration to Remediation

Organizers / Organisateurs: Gema Olivo (Queen's); Tassos Grammatikopoulos (SGS)

Room / Salle: Biosciences Complex, Room 1103

Date: Monday, May 15

Time: 9:10 AM

Presenter: Shishi Chen

Multivariate statistical identification of sandstones affected by uraniferous hydrothermal activity, Athabasca Basin, Canada

Chen, S., schen162@uottawa.ca, Hattori, K., University of Ottawa, Ottawa, ON K1N 6N5, and Grunsky, E.C., University of Waterloo, Waterloo, ON N2L 3G1

Many unconformity-type U deposits in the Athabasca Basin occur along the unconformity between sandstones and the crystalline basement. Principal component analysis (PCA) of the litho geochemistry of sandstones (n = 6305) from the Denison Mines' Wheeler River property shows that U is positively associated with Y+Cu+Zn+Na+W+Co+Ni+B+Mg+HREEs+Cr+Sc+Mo+V+LREEs due to hydrothermal alteration associated with U mineralization. In contrast, PCA of the regional sandstones (n = 2175) in the Athabasca Basin shows that U is positively associated with Th+Ti+Zr+Hf. This elemental assemblage suggests that detrital heavy minerals are the main hosts of U. Additional PCA was conducted to the subset of elements associated with U. Analysis of variance was used to determine 8 PCs that have good discriminating ability. Random Forest Classification (RFC) of the 8 PCs shows three groups of sandstones with high accuracy (94.6%) of discrimination; Group I (above the Phoenix ore), Group II (in the Wheeler River property excluding the sandstones above the ore) and Group III (regional background sandstones in the Basin). Several sandstones of the Wheeler River property are classified into Group I, suggesting that these samples even far (> 200 m) from the ore are cryptically altered to have similar composition as those above the ore. This study shows that PCA and RFC identify elemental assemblages associated with U and cryptically altered sandstones. The information can be useful in exploration for deeply buried U deposits elsewhere in the Athabasca Basin.