

Geochemical Analysis of Host Rock Lithologies at the Arrow Uranium Deposit, Athabasca Basin, Saskatchewan: Interpretation of Protolith and Alteration

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The Arrow uranium deposit is the largest undeveloped uranium deposit in the Athabasca Basin. Mineralization at the deposit is spatially associated with multiple reactivated shear zones and is hosted, exclusively, in basement rock beneath a thin veneer of Athabasca Group sandstone units. The dominant host rock has previously been classified as a semi-pelitic gneiss due to the presence of altered aluminosilicate minerals, which would suggest that the host is metasedimentary in origin. The purpose of this project is to characterize the host rock using whole rock geochemistry and petrography to determine the origin of the semi-pelitic gneiss. Approximately 300 geochemical analyses from the NexGen Energy database, in addition to 15 relatively unaltered drill-core samples were utilized for characterization. High variability in major element composition is a function of the intensity and type of alteration (chlorite, clay mineral, muscovite/sericite, hematite, dravite). The consistency of the porphyroblastic and gneissic textures suggest a dominantly homogenous host rock package that is supplemented by immobile trace elements. This homogeneity would be expected from an igneous protolith, potentially developed in a volcanic arc setting. It can be interpreted, then, that the host rock is igneous in origin, either intermediate or gabbroic in composition, and has been subsequently silicified. Ongoing analysis of the geochemical data, along with petrographic observations, will provide further insight on the origin of the host rock and the compositional changes that resulted from interaction with hydrothermal fluids during multiple mineralizing events.