VGP41A-03 Principal Component Analysis and Mineralogical Studies of Sandstones Overlying the Phoenix U Deposits and REE-rich Maw Zone, Athabasca Basin, Saskatchewan

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Thursday, May 07, 2015 08:30 AM - 08:45 AM
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The Denison Mines' Phoenix deposits, with indicated resources of 70.2 M lbs U_3O_8, occur at the unconformity and along steeply dipping fault in the basement, at ~ 400 m depth. The Maw Zone, REE-rich breccia with surface exposure of 300 x 200 m, consists of highly silicified, hematitized, dravitic tourmaline-rich rocks with high REE (<8.1 wt% as total REE oxides). The Maw Zone is ~ 4 km SW from the south end of Phoenix uranium deposits, but rocks in the Maw Zone do not show significantly high U (< 7.8 ppm in most rocks). Elemental plots suggest that major alteration minerals in sandstones above the Phoenix and in Maw Zone are illite, sudoite, tourmaline and kaolin. The ratios of Mg/Fe above the Phoenix deposits are generally higher than those in the Maw Zone. At the Phoenix site, the ratios of Mg/Fe are higher in deeper sandstones closer to the deposits.

Principal Component Analysis (PCA) of sandstones overlying the Phoenix deposits shows that U is associated with Heavy REEs (HREE)+Y, Light REEs (LREE) and Pb, and inversely correlated with Ti, Zr, Al, and Th. The Maw Zone displays different element groupings: U is strongly correlated with V, Cr, Fe, Ni, Cu, Cd, Na, Li and Ba, but very weakly correlated with HREEs+Y, and inversely with LREEs and P. Relative enrichment of HREEs, Y, and P in the sedimentary units, MFb, MFc and MFd, suggesting that xenotime as the predominant host of the HREEs. The association of LREEs+Sr+Th+P suggests the occurrence of monazite and/or APS minerals. A mineralogical study confirmed xenotime and APS minerals as the major host of HREEs and LREEs, respectively. Xenotime rims zircon grains and forms fine dissemination with magesiofoitite. These REE minerals precipitated from hydrothermal fluids during the brecciation of hematitized sandstones. The positive association between U and Fe in the PCA plot in the Maw Zone suggests that U was transported by oxidized fluids. The absence of U mineralization in the Maw Zone is explained by low U in the oxidizing fluids. Alternatively, the oxidizing fluids did not encounter reduced fluids to precipitate U.

Previously Published

Yes - Saskatchewan Geological Open House 2014, Dec, 2014

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