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Phase analyses of uranium bearing minerals from the high grade ore, Nopal I, Peña Blanca, Mexico.

Ren, M. (UTEP); Goodell, P.(UTEP); Kelts, A.(UTEP); Anthony, E.Y.(UTEP); Fayek, M.(ORNL); Fan, C.(UTEP); and Beshears, C.(UTEP)

The Nopal I uranium deposit is located in the Peña Blanca district, approximately 40 miles north of Chihuahua City, Mexico. The deposit was formed by hydrothermal processes within the fracture zone of welded silicic volcanic tuff. The ages of volcanic formations are between 35 to 44 m.y. and there was secondary silicification of most of the formations. After the formation of at least part of the uranium deposit, the ore body was uplifted above the water table and is presently exposed at the surface. Detailed petrographic characterization, electron microprobe backscatter electron (BSE) imagery, and selected x-ray maps for the samples from Nopal I high-grade ore document different uranium phases in the ore. There are at least two stages of uranium precipitation. A small amount of uraninite is encapsulated in silica. Hexavalent uranium may also have been a primary precipitant. The uranium phases were precipitated along cleavages of feldspars, and along fractures in the tuff. Energy dispersive spectrometer data and x-ray maps suggest that the major uranium phases are uranophane and weeksite. Substitutions of Ca and K occur in both phases, implying that conditions were variable during the mineralization/alteration process, and that compositions of the original minerals have a major influence on later stage alteration. Continued study is needed to fully characterize uranium behavior in these semi-arid to arid conditions.