

LETTER: ACTINIDES IN GEOLOGY, ENERGY, AND THE ENVIRONMENT†

Evidence for nanocrystals of vorlanite, a rare uranate mineral, in the Nopal I low-temperature uranium deposit (Sierra Peña Blanca, Mexico)

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ABSTRACT

The occurrence of vorlanite, cubic CaUO_4 , is reported in the Nopal I uranium deposit (Sierra Peña Blanca, Mexico). This is the first time this rare calcium uranate has been found displaying a cubic morphology, in agreement with its crystal structure. Vorlanite occurs as nanoscale crystals embedded in U-bearing opal, with a Ca/U ratio of ~ 1 . Association with opal suggests that vorlanite formed at Nopal during late-stage U-mobilization under oxidizing conditions and low (< 50 °C) temperature. The presence of nanoscale uranate crystals in an environment largely dominated by uranyl silicates indicates that uranates may play a role in uranium scavenging at low temperature. In addition, the occurrence of vorlanite in the crystal shape consistent with its structure provides unique information on its conditions of formation.

Keywords: Vorlanite, cubic CaUO_4 , uranate, nanoscale crystal, opal, Nopal