GEOCHEMISTRY AND DIAGENESIS OF GROUNDWATER CALCRETES: IMPLICATIONS FOR CALCRETE-HOSTED URANIUM MINERALIZATION, WESTERN AUSTRALIA

Justin Drummond
Geological Sciences and Geological Engineering, Queen's University, Kingston, Ontario, Canada
j.drummond@queensu.ca

Abstract

Groundwater calcrete is loosely defined as a non-pedogenic, intrastratal, calcium carbonate body that is produced from groundwater, where precipitation takes place in the capillary fringe or in the phreatic zone. Groundwater calcrete commonly occur in arid environments, where intense evaporation of groundwater induces carbonate precipitation. In some localities where the regional geology is favorable, groundwater calcretes have been found to contain significant concentrations of uranium. In this particular deposit type, uranium is bound in a potassium uranyl vanadate mineral known as carnotite ($K_2(UO_2)_2(VO_4)\bullet 3H_2O$). Since the discovery of this deposit type in Western Australia in the late 1960s studies have concentrated on the chemical factors influencing carnotite precipitation. The effects of groundwater calcrete on carnotite mineralization have only been considered from a theoretical point of view and have yet to be studied in-depth. This leaves the question of how does groundwater calcrete influence the accumulation of uranium.

Such information is integral in developing an effective exploration model that can be used to search for calcrete-hosted uranium, globally. This study will integrate sedimentology, petrography, isotope geochemistry and radiometric dating techniques to compare mineralized and adjacent un-mineralized groundwater calcretes. This will determine how groundwater calcrete development affects regional groundwater chemistry and the accumulation of uranium into economic deposits. The information gathered from this study will be used to further refine current deposit models and exploration methods for calcrete-hosted uranium deposits throughout Australia and other regions of interest around the world.

AAPG Search and Discovery Article #90249 © 2016 AAPG Foundation 2015 Grants-in-Aid Projects