Mineral Chemistry and Genesis of Uranyl Minerals Associated with Psammitic Gneisses, Abu Rusheid Area, South Eastern Desert of Egypt

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Abstract. Meta-autunite, uranophane, boltwoodite and soddyite are found as yellow crusts and acicular crystals in the voids, fractures and shear zones in the psammitic gneisses of Abu Rusheid area. Optical microscopy, X-Ray Diffraction (XRD), Backscattered Electron (BSE) and Secondary Electron (SE) Imaging, Energy Dispersive X-Ray Spectrometry (EDS) and quantitative Electron Probe Micro Analyses (EPMA) have been used to determine the mineralogical composition, behavior and fate of major and trace elements in the gneissic weathering profile. Coupled substitutions in meta-autunite, Na proxy for K in boltwoodite and formation of soddyite at the expense of uranophane are evident in the study area. Apparently the effect of metamorphism on the pre-existing uranium was limited to a more or less in situ remobilization and concentration. The uranyl minerals appear to be derived from the host rock after being exposed to a long period of alteration and rock–fluids interaction. The segregation of uranyl minerals was driven by the compositional contrast between the migrating fluids and in situ wall rock composition of the fractures. The composition and genesis of uranyl mineralization associated with Abu Rusheid gneisses provide additional information about the behavior of radionuclides in arid environments and at very oxidizing conditions.

Keywords: Mineral chemistry; Meta-autunite; Uranyl silicates; Abu Rusheid; Eastern Desert; Egypt.