

Uranium-sulphides-organic matter-dolomite low temperature diagenetic interplay in Cretaceous continental unconsolidated sediments (Mongolia)

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The Zuuvch Ovoo uranium deposit is located in East Gobi Basin, Mongolia. It is hosted in the Sainshand Formation, an Upper Cretaceous siliciclastic reservoir, upper part of the post-rift infilling of the Mesozoic East Gobi Basin. The Sainshand Formation corresponds to unconsolidated medium-grained sandy intervals and clay layers deposited in fluvial-lacustrine settings. The uranium deposit is confined within a 60-80 m thick siliciclastic sequence inside aquifer driven systems assimilated to roll-front systems. Although the surface regional area is calcite-dominated the roll-fronts located at depth are dominated by dolomite with different textures, which were petrographically classified under four types indicating possible successive recrystallization episodes: (i) microcrystalline, (ii) euhedral, (iii) subhedral and (iv) anhedral, with successive depletion for Rare Earth Elements (REE) and for some minor elements (Sr, Mn). By studying the petrography of pyrite it was possible to identify several generations of framboidal and euhedral pyrite as well as possible geochemical trends. The ore is expressed as uraninite (UO₂) and less commonly as phospho-coffinite (U,P)SiO₄, as (i) U-rich organic matter with or without any distinguishable U-phase, (ii) UO₂ inclusions inside euhedral pyrite and sphalerite, (iii) U-phases as epigenesis of associated pyrite cement, (iv) U-cement in clay matrix, (v) U-cement within euhedral dolomite, (vi) U-oxides associated to quartz cement, (vii) UO₂ replacing Fe-Ti oxides and (viii) U-phases within porous detrital silicates. It was concluded that organic matter and sulphides are the most important agents for uranium trapping and that silicates, clays and Fe-Ti oxides would play minor role. All data taken into consideration, it is proposed that the various dolomite and pyrite types reflect different episodes of fluid-rock interactions with aquifer circulating fluids and redox changes. This sets the geochemical background to document the diagenetic evolution of the roll-front system in relationship to U ore formation stages, leading towards a better understanding of the uranium metallogenic system.