Origins and timing of carbonates in uranium roll-front deposits: a case study of the Djengeldi deposit, Uzbekistan

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Résumé

In the Kyzylkum desert the Maastrichian sandstone formation hosts the Djengeldi uranium roll-front type deposit (Uzbekistan). Dolomite and calcite are the main cement of this formation and of the underlying and overlying stratigraphic levels. These carbonates are not linked to the uranium mineralization process and were precipitated at different periods of diagenetic diagenesis. In the roof and the wall, dolomites formed during eogenesis under oxidizing conditions and are associated with evaporitic facies of the sabkha environment or with paleosols in an alluvial plain, respectively. In the shoreface sands of the reservoir, dolomite predates mineralization, while calcite cementation post-dates it. C and O isotope analyses have shown that the parent fluids of the wall and reservoir dolomites have meteoric signatures. In contrast, roof dolomites reflect a mixture of meteoric and marine waters typical of sabkha environments. Precipitation under reducing conditions, stoichiometry, and thermal fractionation of O isotopes all suggest that Maastrichtian dolomites formed during shallow burial. All calcites show clear meteoric isotopic signatures, and U-Pb dating proved that they result from very recent fluid circulations. This study indicates that carbonate origins from the Djengeldi deposit oppose the proposed deep reduced fluids origin usually mentioned for the other Uzbek deposits. Since these fluids are also invoked as the main reductant for uranium precipitation, this metallogenic model is not supported here.

Mots-Clés: roll, front, uranium, calcite, dolomite, diagenesis, Kyzylkum, Uzbekistan

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