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Metallogenic subtypes of sandstone type uranium deposits and prospecting direction in Junggar Basin, China

Qin, M.K.¹, He, Z.B.¹, Huang, S.H.¹, Liu, Z.Y.¹, Song, J.Y.¹, Xu, Q.¹ and Guo, Q.¹

¹Beijing Research Institute of Uranium Geology, No.10 Xiaoguandongli, Chaoyang district, Beijing 100029, China. qinmk9818@163.com.

1. Geological setting

The Junggar Basin has become one of the focuses recently for sandstone type uranium deposits in prospecting and exploration. The basin that covers ~130,000 km², is located in the northern of Xinjiang Uygur Autonomous Region of Northwest China, and famous for containing various energy resource, e.g. oil, gas and coal. This basin is the eastern part of Kazakhstan-Junggar Plate, and also the stable centre of Junggar Block. The basement of this basin is featured by dual composition, including Precambrian crystallized and Paleozoic Strata, and overlain by Meso-Cenozoic formation with greatest thickness exceeding 10,000m.

2. Metallogenic subtypes of sandstone type uranium deposits

The sandstone type uranium mineralization within the Junggar Basin is characterized by multi-layers, polygenesis, multi-locations, and multi-stages, and can be divided into three subtypes: the interlayer oxidation subtype, the “hydrocarbon-concealing” subtype, and the hydrocarbon-reduction subtype.

The interlayer oxidation subtype mainly occurred in several formations that include Lower Jurassic Badaowan Formation, Lower Jurassic Sangonghe Formation, and Middle Jurassic Toutunhe Formation.

The “hydrocarbon-concealing” subtype mainly occurred in northwest of Junggar Basin, and means that the paleo-interlayer oxidation uranium orebodies were superimposed by the secondary reducing belt that generated by the charging of the subsequent oil and gas which made this subtype to be detected by conventional exploration techniques difficultly.

The hydrocarbon-reduction subtype mainly occurred in Cretaceous, and characterized by lack of reduction material initially which made the later hydrocarbon injection to increase its reduction capacity necessarily for uranium mineralization of interlayer water re-infiltration.

3. Metallogenic potential and prospecting direction

a. Because of dual basement with developed paleo-massif, high uranium content of the basement, appropriate Meso-Cenozoic tectonic evolution, beneficial depositional formation and sufficient epigenetic reworking, the Junggar Basin possesses the basic factors for forming large-scale sandstone type uranium deposits.

b. The prospecting for uranium deposits should be focus on the interlayer oxidation subtype. The first priority should be the Middle-Lower Jurassic in eastern region of Junggar Basin.

c. In the northwest Junggar Basin, the dark coal-bearing clastic formation with oil and gas charging strongly shows well metallogenic potential for the “hydrocarbon-concealing” uranium deposits.

d. Due to the intensive tectonic activities at Cenozoic, the southern margin of Junggar Basin should be the favourable area for the residual interlayer oxidation subtype uranium deposits.

