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Research on the Fluid of Mengqiguer Uranium Deposit

XIU Xiaoqian*, SUO Shixin, LIU Hongxu, ZHANG Yuyan, ZHANG Xiao, PAN Chengyu

CNNC Key Laboratory of Uranium Resources Exploration and Evaluation Techniques, Beijing Research Institute of Uranium Geology, Beijing 100029, China

1 Research Status

Mengqiguer uranium deposit at the southern margin of Yili basin and even the whole country is typical of the interlayer oxidation zone sandstone type uranium deposits, because of its high grade, large reserves, which has been concerned of metallogenic conditions, ore controlling factors, mineralization mechanism by geological workers with a large number of studies.

But the study of fluid inclusions is only a little. In this paper, by studying ore-forming fluids of the uranium deposit process with the analysis of inclusion, hydrocarbon acidolysis and vitrinite reflectance properties, find the ore-forming fluid including water with uranium and oxygen and reducing gases.

2 Fluid Inclusions

In this paper, fluid inclusions located in quartz fragment fracture, are mainly rich liquid brine inclusions and hydrocarbon-containing aqueous inclusions, and the inclusions which are round and oval are into a linear distribution; the former are colorless or gray while the latter are yellowish brown or yellow brown.

The homogenization temperature of inclusions ranges from 50 to 77°C, concentrated in the 62–73°C, an average of 66.2°C, so the deposit is a low temperature hydrothermal uranium deposit. The salinity of inclusions ranges from 1.4% to 14.04% (NaCl_{eq}), concentrated in the 2–8%, an average of 4.49%, showing that the ore-forming fluid is at low salinity. Test results of homogenization temperature and salinity are similar with Wu Bailin's (2007) 73–93°C and 5.3%–7.5%. The ore-forming fluid has features of low temperature and low salinity.

According to Liu Bin (1987) formula of the inclusion

density, calculate the deposit fluid density from 0.98 to 1.08 g/cm³, an average of 1.01 g/cm³, showing that the ore-forming fluid is the medium-density fluid.

3 Reducing Gas

By analysing acidolysis hydrocarbon of samples, found that hydrocarbon gas is mainly methane and ethane (79.13–94.62%), and propane (0.12–12.72 μL/kg), isobutane (0.05–0.78 μL/kg), n-butane (0.06–3.63 μL/kg), ISO pentane (0.05–0.37 μL/kg) and pentane (0.05–1 L/kg).

In order to investigate the detected gaseous hydrocarbons, this paper analyzed vitrinite reflectance on organic matter in sand bodies. The vitrinite reflectance “R_o” of Mengqiguer uranium deposit ranged from 0.40 to 0.74%, and the average value is 0.58%. Nation and foreign standards of the vitrinite reflectance is: R_o < 0.50%, immature stage; R_o=0.50%–0.80%, early maturity, producing methane and other simple hydrocarbons; R_o=1.00%, the peak of oil generation; R_o=1.30%–2%, producing moisture and condensate oil; R_o > 2%, as the mature phase, generating dry gas. The evolution of organic matter in Mengqiguer uranium deposit is in the early stage of maturity, and gaseous hydrocarbons is dominated by methane and ethane.

4 Discussion

4.1 Water containing uranium and oxygen

There are many types of water, such as magmatic water, meteoric water and seawater, which is the most important on mineralization (Tian et al., 2010). The deposit is located in the continental and coal bearing grey clastic rock formation, which showed that the water containing oxygen and uranium could not come from sea water. Nash

* Corresponding author. E-mail: suoshixin123@163.com

(1976) found that the high salinity high temperature (salinity >30 wt%, temperature >400°C) represent original magmatic hydrothermal fluid. By the above research, we found the metallogenic fluid of Mengqiguer uranium is a medium density fluid at low temperature and low salinity, obviously different from the original magma hydrothermal. And Jurassic strata is uplifted and outcropped in nappe tectonic compression coursed by the southern margin of the basin, which resulted in the ore bearing strata in open source region, where water containing uranium and oxygen comes into the ground for mineralization. Therefore, ore-forming fluids of the deposit have the nature of atmospheric water in origin. The deposit is epigenetic, hypogene and epithermal uranium deposit. The water containing Uranium and oxygen flows through the southern provenance strata, carrying a large number of uranyl compounds, reforming the ore bearing strata and leads to the uranium of the strata migrating, which is the basis of the mineralization by providing sufficient uranium source for mineralization.

4.2 Reducing gas

The reducing gases comprising a hydrocarbon gas, H₂, H₂S etc, are important reducing material for the deposit, which play an important role on the reduction, precipitation and enrichment of uranium. In this paper, with the analysis of vitrinite reflectance, found hydrocarbon source may be related to the thermal evolution of organic matter. But Mengqiguer uranium deposit located in the southeast wing of Zakistein drawer-type syncline, with southern strata inversion, ore-field structure development and deep communication formation, may lead to oil and gas from deep formation into the mining area for mineralization, so there is no evidence whether oil and gas from deep formation is in metallogenic. we can do some further studies.

5 Conclusions

(1)Secondary inclusions in quartz fissure are mainly rich liquid brine inclusions and liquid hydrocarbon inclusions. Homogenization temperature of inclusions is 66°C, salinity ranges from 1.4% to 14.04%. The density of the metallogenic fluid is about 1.01 g/cm³.

(2)The ore-forming fluid is consisted of mineral water containing oxygen and uranium and reducing hydrocarbon. The former is the low temperature, low salinity and medium density fluid, with the property of atmospheric precipitation, showing Mengqiguer uranium deposit is an epigenetic, hypogene and epithermal uranium deposit; the latter is mainly consisted by methane and ethane, which may be coursed by the thermal evolution of organic matter, and we can do further studies on whether there is reducing oil and gas from deep formation in mineralization.

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