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Discussion on Curst Maturity and Uranium Metallogenic Favourability —Case-study of Laoyaquan Granite Pluton in Eastern Junggar, Xinjiang Autonomous Region

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1 Introduction

Junggar large superimposition basin is the second major sedimentary basin in Xinjiang Autonomous Region with the area of about 13×10^4 km^2. Its tectonic location, basin types, main sedimentary facies of covering strata and regional uranium mineralization conditions are similar to those of Yili typical uranium-producing basin. In terms of this reason, the basin generally possesses a number of basic favorite conditions for the occurrence of sandstone type uranium mineralization. However, successful breakthrough in U exploration has not been achieved up-to-date. Therefore, there are some crucial problems that the uranium exploration decision-making departments and production units are facing to and urgent to understand or answer: a) how is the sandstone type uranium mineralization prospect? b) is it potential to form large or superlarge sandstone type uranium deposit? c) if it has, where should we go to explore? and d) how to achieve a fast breakthrough?

Based on the previous research work, the Hercynian fold basement at periphery of the basin has been selected as the research objectives. In this paper, the crustal maturity and tectonic metallogenic favourability degree of the fold basement will be discussed. The field geological survey work was carried out combined with indoor chemical analysis and test, moblile uranium leaching experiment and zircon LA-ICP MS analysis and test. Some conclusions are shown as follows.

2 Conclusion and Discussion

Isotopic chronological data analysis show that tectonic magmatic activities around the Junggar basin margin began in Late Devonian, and peaked Late Carboniferous. Also, the activities occurred in Permian at the northern margin of Altai and Dalabute belt in western Junggar, which led to wide development of igneous rock belts around the basin margin forming the main body of the folded-basement (Kwon et al., 1989; Chen and Jahn, 2004; Zheng et al, 2007; Geng et al., 2009; Yin Jiyuan, 2011; Han Yujie, 2012).

Geochemistry analysis results of typical granite in Kelameili area, Eastern Junggar, Dalabute belts, Western Junggar and Aletai-Fuyun-Buergen region, Northern Junggar show that rocks studied are generally rich in silicon, alkali, large-ion lithophile elements (LIL) and high field strength elements (HFS) with high ratio value of K_2O/Na_2O (>1) and high FeO/MgO ratio (>1). They belong to high K calc alkaline series with the ancient crust thickness mostly being more than 35km, when rocks are formed. That is to say, the magma evolution at the periphery of the basin reached a matured stage and the uranium is continuously accumulated in crust during the evolution process and finally U-rich granites originate from matured crust appeared thus providing material base for the sandstone type uranium mineralization.

The characteristics of major and trace elements in most granitic rocks are in accordance with those in A_2 type alkaline granite, and they belong to the post collisional granitoids or with in plate ones which indicate that the basin at that time entered into the post collision tectonic environment at the end of magmatic activity. In other words, a stable weakly extensional tectonic setting being favorable for the formation of sandstone type uranium deposits.

Based on the above research results, the suggestions can be obtained as the following. Junggar basin has possessed certain metallogenic conditions for sandstone type

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uranium mineralization, such as: relatively stable tectonic environment from Late Devonian to Eogene, and matured Hercynian igneous rocks which can provide certain source material for uranium mineralization.

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