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The Relationship between Basic Intrusive Dykes and Uranium Mineralization and Deposit Examples

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1 Introduction

Basic intrusive dykes is on the background of continental extension, the intrusion of magma from the mantle lithosphere, the product of the partial melting of mantle lithosphere and the product of mantle derived magmatism, therefore many scholars hold that ore deposits which related to the mantle fluid have the relationship with the basic intrusive dykes. Many of the world's uranium deposits have the connection with the basic intrusive dykes in terms of formation time and space and genesis.

2 The Relationship between Basic Intrusive Dykes and Uranium Mineralization

Relationship between basic intrusive dykes and uranium mineralization includes two types: forming in the interior of the basic intrusive dykes and locating in the contact area formed by basic intrusive dykes and silicified belt; Most of the uranium mineralization later than the basic intrusive dykes on the space of forming time, a handful of uranium mineralization at the same time of basic intrusive dykes. Xiazhuang ore field in South China is the most typical example of the first type, while the most typical case of the second type is the uranium mineralization of the lamprophyre in Mianning.

China's basic intrusive dykes are closely associated with uranium mineralization. Such as Xiazhuang uranium ore field and Xiazhuang uranium ore field uranium mineralization have close relationship with basic intrusive dykes, the mantle derived basic intrusive dykes developed greatly at the NWW, NNE and NEE in scope of Xiazhuang uranium ore field, the previous study shows that the forming time is about 140 Ma and 105 Ma and 90 Ma, And uranium mineralization in the region of 138-78

Ma (Zhang Liang, 2013), The Xiangshan uranium orefield mainly has two stage of uranium mineralization, respectively, alkali metasomatism type, about 115 Ma; The second period for acid metasomatism type, about 100 Ma, namely uranium mineralization is concentrated in 115-100Ma (Zhang Liang, 2013). Relevant scholars group Xiangshan ore fields within the lamprophyre divided into three stage: 134 Ma, 134-120Ma, 84.5 Ma (Rao Zehuang, 2012). Thus, it can be seen that basic intrusive dyke and uranium mineralization have certain corresponding relationship in time and space.

During the process of uranium mineralization, the basic intrusive dyke has certain genetic relationship with uranium mineralization. Basic rock and ore-forming fluid are homologous, basic rock can provide the mineralizer CO₂ what the uranium mineralization need during the process of rising, moreover, because the basic intrusive dykes have different physical and chemical properties from granite, it can form the geochemical interface in the contact zone, provide a place for the enrichment of uranium deposits.

3 Lamprophyre Uranium Mineralization of Mianning

Lamprophyre uranium mineralization of Mianning is located in the north of the Kangdian earth's axis, mineralization type is given priority to lamprophyre uranium mineralization, the feature of this uranium mineralization is uranium mineralization occurs in lamprophyre plume, strictly controlled by lamprophyre plume along the fracture, this characteristic is different from uranium mineralization characteristics of basic intrusive dykes which we known.

According to relevant data, the lamprophyre in the Mianning area can be divided into normal lamprophyre and mineralized lamprophyre. Two classes of lamprophyre are produced in different period stage, mineralization

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lamprophyre formed later than normal lamprophyre (Sun Yue, 2013). Relevant scholars argue that lamprophyre in the area is not the products of crystallization differentiation of the granite, lamprophyre formed in the Himalayan Shear extensional tectonic environment (Sun Yue, 2013). the mantle of asthenosphere upwell and metasomatism mantle and then partial melting, rising along the fracture form normal lamprophyre, mineralized lamprophyre formed under the action of liquid immiscibility 、 magmatic differentiation、 gas liquid separation and some strong fluid. Solubility of uranium increase with the increase of the halogen element, U^{4+} can improve solubility through forming the complex with the halogen element (Rao Zehuang, 2012), and then rich potassium quality basic magma of the enrichment mantle source contiune to differentiate, and form the magma which enrich potassium, iron, titanium and volatile (F, Cl, CO_2 , etc.), during the process of rising, these volatile improve the solubility of uranium in the granite, and then form uranium fluorine chlorine complex, the uranium fluorine chlorine complex can make up the ore forming fluid with basic magma of lamprophyre, the ore-forming fluid migrate to the surface along the fracture, then quickly precipitate in the environment of cooling step-down and so on, titanium of fluid transform into TiO_2 under the condition of oxidizing condition, and then product the

brannerite with U^{4+} , the precipitation, migration and mineralization enrichment of uranium all occurred in the fluid, the basic magma of mineralized lamprophyre derived from the mantle source have played the role of mineralizer, so the uranium mineralization directly occurred in the lamprophyre vein.

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