

# PRECIPITATING MECHANISM OF URANIUM IN THE DISCHARGE AREA OF THE XIAZHUANG ORE-FORMING FOSSIL HYDROTHERMAL SYSTEM, SOUTH CHINA

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The Xiazhuang uranium ore-field is located in Guangdong Province, southern China, which is one of the largest uranium fields in this country. The uranium deposits in the field are considered to be the product of water-rock interaction in the discharge area of the fossil hydrothermal system. The main species of uranium in the ore-forming hydrothermal solution are  $\text{UO}_2(\text{CO}_3)_2^{2-}$  and  $\text{UO}_2(\text{CO}_3)_0$  during the pre-mineralization epoch, and  $\text{UO}_2\text{F}_3^-$  and  $\text{UO}_2\text{F}_4^{2-}$  in mineralization epoch. In order to study the mechanism of uranium precipitation, a comprehensive hydrogeochemical parameter  $E_{\text{hw,u}}$  is proposed. The  $E_{\text{hw,u}}$  is equal to the difference between the Eh value of solution ( $E_{\text{hw}}$ ) and the oxidation-reduction critical potential values ( $E_{\text{hc,u}}$ ) of the uranyl complex, that is,  $E_{\text{hw,u}} = E_{\text{hw}} - E_{\text{hc,u}}$ . Only when the  $E_{\text{hw,u}}$  is less than zero, can the precipitation of uranium take place. In the hydrothermal system, the  $E_{\text{hc,u}}$  values range from 0.18V to 0.20V in the pre-mineralization epoch which are positive, so no uranium mineralization formed. However, during the mineralization epoch, the  $E_{\text{hc,u}}$  values are changing from -0.31V to -1.5V which are negative, so uranium precipitation consequently formed. The uranium process can be inferred as: when the solution entered into the discharge area (depressurization area), oxidation-reduction critical potential values ( $E_{\text{hc,u}}$ ) of the uranyl complex were rapidly increased due to  $\text{CO}_2$  degassing and evolution of pH value of the solution from alkali toward neutrality, the  $E_{\text{hw,u}}$  turned into negative and reduction precipitation of uranyl complex occurred in the discharge area of the hydrothermal system.