

Characteristics and formation conditions of chlorite in the Shangjiao uranium deposit in the Southern Jiangxi Province, China

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Abstract: Chloritization is one of the most important alteration types and prospecting indicators in the Shangjiao uranium deposit. Based on the detailed field and indoor petrographic observation of the rock and ore samples from the silicified zone in the Shangjiao uranium deposit, electron probe microanalyzer (EPMA) is employed to study paragenetic association characteristics and morphological features of chlorites and to analyze chemical compositions of chlorites, then to classify chemical types of chlorites, to calculate formation temperatures and $n(A1)/n(A1+Mg+Fe)$ values of chlorites, and finally to discuss the formation mechanism and the relationship with uranium mineralization of the deposit. Some following conclusions have been reached in this study. ① There are four types of chlorites, including chlorite formed by alteration of biotite, chlorite vein/veinlet filling in fissures, chlorite closely associated with uranium minerals, and chlorite transformed from clay minerals by adsorbing Mg and Fe cations; ② The Fe-Si diagram has revealed that the chlorites are mainly plotted in the brunsvigite area, partly plotted in the pycnochlorite area and in the ripidolite area, respectively; ③ Argillite is the main source rock of the chlorite in this deposit. The chlorites are products of multiple geological processes, with the formation temperatures varying from 195.73 °C to 230.94 °C, at an average of 219.01 °C, suggesting they were formed under a medium to low temperature condition; ④ The chlorites were formed under the reduced condition with low oxygen fugacity and high sulfur fugacity through two formation mechanisms of the dissolution-precipitation and the dissolution-migration-precipitation; ⑤ The chloritization has changed the physicochemical properties of wallrocks and the occurring state of uranium in rocks, provided the required environment for uranium mineralization, and promoted the activation, migration, and precipitation of uranium.

Keywords: Chlorites; Electron probe micro-analyzer; Formation temperature; Uranium metallogenesis; Shangjiao uranium deposit