Isotopic geochemistry of the Xiwang uranium deposit in Wengyuan,China

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The Xiwang granite type uranium deposit in Wengyuan county of Guangdong Province of China occurred in the Indosinian Xiazhuang granite located in the northeastern part of Guidong composite granite pluton. The Ore bodies in the deposit are dominantly controlled by silicification zone. Uranium mineralization was mainly related to silicification, pyritization and hematitization. Ore minerals include mostly uraninite, pyrite, hematite, quartz, fluorite and calcite.

The compositions of $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$ and $^{208}Pb/^{204}Pb$ of the pyrite from the orebodies are 19.004~19.850, 15.730~15.782 and 38.743~39.051 respectively. The ratiaos of $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$ and $^{208}Pb/^{204}Pb$ of the potassic feldspar from the Xiazhuang granite are 18.180~18.488, 15.655~15.661 and 38.527~38.694 respectively. The ratiaos of $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$ and $^{208}Pb/^{204}Pb$ of potassic feldspar from Maofeng granite are 18.287~22.019, 15.491~15.863 and 38.123~38.337 respectively. The lead isotopic compositions of the ores are very different from those of the Xiazhuang granite, but compatible with those of the Maofeng granite, which suggests that the ore-forming materials may have come from the Maofeng granite.

The δD values of fluid inclusions in the quartz in the early metallogenetic period and in the late period are -97 ~ -75‰ and -71 ~ -62‰ respectively. The $\delta^{18}O$ values of the quartz in the early metallogenetic period and in the late metallogenetic period are 10.1~13.6 ‰ and 8.1~9.5 ‰ respectively. The $\delta^{18}O$ values of the ore-forming fluids calculated from the $\delta^{18}O$ values of the quartz in the early metallogenetic period and in the late period are 1.2~4.7‰ and -9.4~ -8.3‰ respectively. The compositions of δD and $\delta^{18}O$ of the ore-forming fluids in the two metallogenetic periods are very different, which indicates that there were two different fluid sources. The early fluids were mainly derived from the mantle fluids originated from Paleopacific subduction zone by dewatering of sediments[1]. The compositions of δD and $\delta^{18}O$ of fliuds in the late period are consistent with those of meteoric water, which suggests that the ore-forming fluids in this period may derived from meteoric water.

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References

[1] Lu JJ, Wu LQ and Ling HF et al. (2006) Acta Petrologica Sinica 22, 397-406.