Study of hydrogeochemical conditions of *in situ* leach uranium mining in the Shihongtan deposit

B. GAO*, H. ZENG AND Z.X. SUN

Laboratory of National Defence Key Discipline of Radioactive Geology and Exploration Techniques (East China Institute of Technology), Fuzhou, Jiangxi 344000, China (*correspondence: bgao@ecit.edu.cn)

In situ leaching (ISL) mining is in use commercially and offers many cost and environmental advantages in uranium extraction. The Shihongtan uranium deposit is one of the biggest sandstone-type uranium deposits in China, but the pilot acid and alkaline ISL mining of the deposit failed due to serious chemical plugging.

The water chemistry of groundwater in the ore-containing aquifer is given in Table 1.

pH	K^+	Na^+	Ca^{2+}	Mg^{2+}	HCO_3^-	SO_4^{2-}	Cl^-
7.3	21	2033	752	365	481	3150	3370

Table 1: Hydrochemistry of groundwater in the deposit (Concentrations in mg/L)

The groundwater is quite saline with TDS higher than 10 g/L. Geochemical simulations using PHREEQC show that The saturation index of $CaSO_4$ and $CaCO_3$ is higher than 0 in natural conditions. Gypsum will precipitate during the sulphuric acid leaching and calcite will be precipitate with the alkaline leaching. Both gypsum and calcite can cause plugging of pores of the host rock and reslut in failure of ISL mining.

The hydrogeochemical studies imply that sulphuric acid leaching or alkaline leaching is not suitable for the mining of the deposit. Therefore, ameliorating the hydrochemical conditions for uranium leaching is necessary. A new technique so called groundwater dilution-based with little reagent ISL uranium mining technology with four key techniques incluing dilution, oxidation, adding NH_4HCO_3 and acidification is proposed. The chemical plugging problem is solved by the new technology and the ISL mining in the high salinity groundwater area becomes feasible.

The study was supported by the projects of the National Natural Science Foundation of China (No. 40872165) and Science bureau of Jiangxi Province (No.2009AF00100).

Microgeochemistry of rutile and zircon in eclogites from the CCSD main hole: Implications for the fluid activity and thermo-history of the UHP metamorphism

CHANGGUI GAO[1]*, YONGSHENG LIU[1,2] AND KEQING ZONG[1]

[1]State Key Laboratory of Geological Processes and Mineral Resourses, Faculty of Earth Sciences, China University of Geosciences, Wuhan 430074, China (*correspondence: gaochanggui_1214@163.com)

[2]State Key Laboratory of Continental Dynamics, Northwest University, Xi'an 710068, China

Watson *et al.* [1] and Zack *et al.*[2] and Tomkins *et al.*[3] reported different temperature calculation by the Ti-in-zircon and Zr-in-rutile geothermometers. When we use these geothermometers to estimate the temperatrue evolution of UHP metemorphism at Dabie-Sulu eclogite, some specail problems come out.

Both single spot and profile analyses of large matrix rutiles (> 60 μm) generally demonstrate core-rim variability of Pb, Sr, Zr and U. Estimated temperatures within the cores of matrix rutiles correlate positively with grain diameter. This suggests that the Zr content in rutiles is not only dependent on temperature and pressure, but is also affected by fluid activity and Zr diffusion. Estimated temperatures within the cores of matrix rutiles merely repersent lower limits of the peak ultra-high pressure metamorphic temperatures.

Combined with Th/U and Ce/Lu ratios, rare earth element (REE) patterns and $^{206}Pb/^{238}U$ ages, Ti-in zircon geothermometers can be used to distinguish the thermal evolution of eclogites during the UHP metamorphism. (1) the inherited zircons record their crystallizing temperatures at the end stage of the original magma; and (2) metamorphic zircons may record both prograde and post-peak metamorphic temperature evolutions; (3) the traditional peak metamorphic zircons are probably not products of the peak UHP metamorphism, but instead crystallized during the post-peak metamorphism and record metamorphic temperatures subsequent to the pressure decrease. The much higher temperatures recorded by rutiles in samples adjacent to the ultramafic rocks and by zircons indicate that there may have been a locally short-lived heating event.

[1] Watson *et al.* (2006) *CMP* **151**, 413–33. [2] Zack *et al.* (2004) *CMP* **148**, 471–488. [3] Tomkins *et al.* (2007) *JMG* **25**, 703–713. [4] Gao *et al.* (2009) *Lithos* **115**, 51–64