Experiments on water rock interactions at temperatures up to 435ºC and its implications on geophysical features in the mid-crust

SHUMIN HU, RONGHUA ZHANG, XUETONG ZHANG

Institute of Mineral Resources, Chinese Academy of Geological Sciences, Lab. Geochemical Kinetics. Baiwanzhuang road 26, Beijing, 100037 (zrhhsm@pku.edu.cn)

For purpose of understanding geophysical nature of the crust, e.g. high conductance-low velocity zone and earthquake sources in mid-crust, experimental studies on dry rock system were performed. As well know fluids distribute in the crust, so far a few experiments on rocks combined with water (water – rock system) have been done. The mid-crust is present in the depth of 10 to 25 km below surface. Temperature of top of the zone is about 300ºC, the bottom temperature is about 450ºC. We have carried out a series of dissolution experiments on mineral and rock samples in aqueous solutions using flow through reactors at temperatures as high as 435°C and at pressures of 22-35 MPa. These experiments produce useful information for evaluating the behaviour of crust fluids and their role in the formation of geophysical detectible anomalies in the mid-crust. The steady state dissolution rates of minerals or rocks are measured as functions of temperature, flow rate and pressure. The maximum release rates of Si for silicate minerals are always observed at 300°C (or at 300-400°C for silicate rocks), which results in strong leaching of Si and the break-up of silicate framework structures in minerals and rocks.

From a tectonic perspective, plate motions are ultimately responsible for inducing cracking in rocks, generating porosity, decreasing pressure, and moving fluids across and through continents. These processes of decreasing pressure probably lead to the migration of aqueous fluid in the mid-crust to locations where they are close to their critical state at temperatures ranging from 300 to 435°C. Therefore, water rock interactions occurring in the crust will cause strong leaching of Si, breakage of silicate framework structures, and rock collapse. The strong water-rock interaction will further lead to the generation of increased rock porosity and also drive fluid flow. Simultaneously, experiments and theoretical studies indicated that aqueous solutions at temperature range from 300 to 400ºC, or from the sub-critical to critical regions, exhibit high conductance. Thus, mid-crust fluids accompanied strong water-rock interactions, will behave the high conductance-low velocity feature.

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The adakite and Fe-Cu-Au mineralization in the Luzong volcanic basin, central Anhui

HU SHUNTIAN, GAO ERGEN AND HE SHIGEN*

Institute of Disaster Provention Science Technology, Beijing 101601, China (*correspondence: grg@ustc.edu.cn)

Introduction

Yangtze valley is one of the most important metallogenic region in East China, where more than 200 polymetallic deposits have been discovered [1-15]. Among them, the Luzong Cretaceous volcanic basin is famous for its richness of Fe-Cu-Au metal mineralization. Here we study the relationship between adakitic rocks and Fe-Cu-Au mineralization to find a clue for formation of large sacle of polymetal mineralziation in this Cretaceous volcanic basin.

Methods and Results

Data of major and trace elements calculated from the publications from the Luzong volcanic basin and its adjacent region, such as the Shaxi, Anqing, Chuxian, Tongling Fe-Cu-Au deposits are collected and computed [1-8], it is found that the geochemical processing of this famous Fe-Cu-Au mineralization is close relationship with those of adakitic rocks widely distributed in this region. It is concluded that this ore-forming process was due to subduction of west Pacific plate, when released large ion lithophile element-rich fluids, inducing both metasomatism and partial melting triggered a large mount of polymetal mineraliztion [10, 11].

[1] Chang, Y. F. *et al*. (1991) *Geol. Publ. House*, Beijing. [2] Zhai, Y.S. *et al*. (2006) *Ore Geol. Rev*. **11**, 229-248. [3] Yang, X.Y. *et al*. (2002) *N. Jb. Mineral. (Abh.)***177**, 293-320. [4] Yang, X.Y. & Lee, I.S. (2005) *N. Jb. Mineral. (Abh.)* **181**, 223-243. [5] Yang, X.Y. *et al*. (2006) *J. Geol. Soc. India* **67,** 475-494. [6] Yang, X.Y. *et al*. (2007a) *J. Geol. Soc. India* **70**, 235-251. [7] Yang, X.Y. *et al*. (2007b) *Acta Geol. Sinica* **76**, 477-487. [8]Yang, X.Y. *et al*. (2010) *Int. Geol. Rev*. http://dx.doi.org/10.1080/00206810903211906. [9] Sun, W. D. *et al*. (2003) *Econ. Geol*. **98**, 175-180. [10] Sun, W. D. *et al*. (2007) *EPSL* **262,** 533-542. [11] Ling, M. X *et al*. (2009) *Econ. Geol*. **104**, 303-321. [12] Deng, J. *et al*. (2007) *Acta Geol. Sinica* **81**, 287-296. [13] Xie, J.C. *et al*. (2009). *Int. Geol. Rev*. **51**, 388-421. [14] Pan, Y. M. and Dong, P. (1999). *Ore Geol. Rev*. **15**, 177-242. [15] Mao, *et al*. (2006) *Ore Geol. Rev*. **29**, 307-324.