The Chemical and Isotopic Characters of Suspended Particulate Materials in the Yangtze River and Their Environmental Implications

T. P. DING[1,2,*], J. F. GAO[1,2], G. Y. SHI[3], F. CHEN[3], C. Y. WANG AND X. R. LUO

[1]MLR Key Laboratory of Metallogeny and Mineral Assessment, IMR, CAGS, Beijing 100037, China. [*](Correspondence: tding@cags.ac.cn)
[2]MLR Key Laboratory of Isotope Geology, CAGS, Beijing 100037, China.
[3]Hydrological Bureau, CJW, Wuhan 430010, China

The mineral, chemical and isotopic compositions of the Suspended particulate materials (SPM) in the Yangtze River were determined systematically on the samples collected in the period of 2003 ~ 2007.

Large spacial and temporal variations of SPM contents are observed in the Yangtze River, reflecting the changes of flow speed, runoff and SPM supply. Significant SPM sedimentation in the Three Gorge Reservoir leads to increase of embankment washout in downstream section and reduction of sedimentation in the Dongting Lake, Poyang Lake and the estuary. The difference on mineral compositions indicates that the chemical weathering activity in the Yangtze area is more intensive than in the Yellow River area.

The SiO_2 and Na_2O contents in SPM of the Yangtze are higher than those of the Yellow River, reflecting the difference on weathering conditions. The $(CaO + MgO)/SiO_2$ ratio in the Yangtze SPM decreases downstream, reflecting also the change of weathering conditions.

The Co, Ni, Cu, Zn, Pb and Cd contents in the Yangtze River SPM are higher than the average values of the upper crust rocks. The contents of Cu, Zn, Pb and Cd in the Yangtze River SPM are several times higher than in the bed sediments, probably reflecting increase of mining activities in recent years. The REE distribution pattern of Yangtze River SPM is similar to that of upper crust, indicating that the source rocks in the Yangtze basin have chemical compositions similar to upper crust.

The $\delta^{30}Si$ variation range (-1.1‰ to 0.3‰) of the Yangtze SPM is similar to that of shale and lower than that of granite rocks, reflecting the silicon isotope fractionation in weathering process. The decrease trend of $\delta^{30}Si$ from upper reaches to middle and lower reaches may be interpreted by the increase of clay minerals downstream.

*This work was supported by the Ministry of Science and Technology (2004DIB3J081) and the Ministry of Land and Resources (Item No.20010209).

Sub-continental Nb/Ta and Zr/Hf amphibolites: implications on subduction metamprphism

XING DING[1*] AND WEIDONG SUN[2]

[1]State Key Laboratory of Isotope Geochemistry, Chinese Academy of Sciences, Guangzhou, P. R. China, (xding@gig.ac.cn)(* presenting author)
[2]Key Laboratory of Mineralogy and Metallogeny, Chinese Academy of Sciences, Guangzhou, P. R. China, (weidongsun@gig.ac.cn)

Mobilities and fractionations of high field strength elements (HFSEs), especially Nb and Ta within subducting slab, are important for deciphering the formation of the continental crust (CC)[1-4]. Here we report mineral and geochemical studies on epidote garnet amphibolite facies metagabbro located near the margin of an eclogite zone in the Tongbai-Dabie orogenic belt, central China. The samples were hydrated during prograde metamorphism of the Triassic plate subduction.

Major minerals such as amphibole, garnet, rutile and ilmenite and bulk rocks of the garnet amphibolite show overall lower Nb/Ta and Zr/Hf than the continental crust (sub-continental), suggesting major Nb/Ta and Zr/Hf fractionations during gabbro to amphibolite transformation. Nb/Ta in bulk rocks varies from 9.4 to 15.5, with the average of 11.3 while Zr/Hf changes from 30.7 to 36.3, with the average of 33.8. Notably, Nb/Ta in rutile varies from 11.5 to 24.2, with the average of 15.3 whereas Zr/Hf ranges from 12.7 to 51.7, averaging 23.8. LA-ICPMS *in situ* trace element analyses of rutile and amphibole grains display remarkable chemical zonations. In general, the cores of rutile are usually small with much higher Nb, Ta concentrations and lower Nb/Ta ratios compared to the thick rims. Such HFSE fractionations may be explained by diverse external fluid activities: the gabbro first absorbed low Nb/Ta fluids that were released during blueschist to amphibolite transformation in deeper portions of the subducting slab, followed by acquiring external fluids with elevated Nb/Ta released during amphibolite to eclogite transformation. Fluids with various Nb/Ta signatures can be transferred to cold regions within a subducting plate and also to the mantle wedge through fluid-rock reaction.

[1] Ding *et al*.. (2013) *J. Geol*. **121**, doi: 10.1086/669978. [2] Xiao *et al*.. (2006) *Geochim. Cosmochim. Acta* **70**, 4770-4782. [3] Liang *et al*.. (2009) *Chemi. Geol*. **268**, 27-40. [4] Ding *et al*.. (2009) *Int. Geol. Rev*. **51**, 473-501.

DOI: 10.1180/minmag.2013.077.5.4