Geochemistry and environmental impact of cadmium in cadmium-rich Pb–Zn mine wastes of Southwest China

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Much attention has been paid to the environmental impact of cadmium (Cd) in the Pb–Zn mineral processing wastes [1, 2]. In order to identify the potential environmental risks of Cd, we studied the geochemical behaviours of Cd in the mine wastes from the China's largest Jinding Pb-Zn deposit located in southwest China. The result showed that the oxidized ores have the lower Zn/Cd ratios [3], suggesting that Cd tends to become enriched in the secondary minerals during the weathering processes. Based on the results of X-ray diffraction and scanning electron microscope studies combined with energy-dispersive spectrometry, Cd is also incorporated into secondary mineral smithsonite. Leaching test indicated that Cd was easily released from the oxidized ores, and the abundance of smithsonite was the main carrier to control the leaching processes [3]. Sequential extraction suggested that high Cd levels in the weak-acid extracted fraction have significant mobility and bioavailability into the ambient environment [1, 4]. Therefore, cadmium in the mine wastes from Cd-rich Pb–Zn mine areas appears to pose high potential for environmental risk, especially in the aquatic ecosystems [2].

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Partial melting processes during exhumation of the subducted continental crust in the Sulu UHP terrane, China

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During the continental deep subduction process, it was deduced that no significant dehydration occurs, and syn-collisional magmatism is generally absent. However, some field observations, together with U-Pb dating, REE and Hf isotope analysis results of zircons, will be presented here, to disclose obvious fluid/melt activities and partial melting processes during the early stage of exhumation of the subducted continental crust in the Sulu UHP terrane.

In the southern Sulu UHP terrane, some zoisite-kyanite-paragonite quartz noddles occur in epidote-bearing eclogite in the Donghai area. Zircons from a noddle give a SHRIMP U-Pb age of 219±9Ma. The cores and rims of the zircons from the country gneiss of the epidote-bearing eclogite show irregular patch structures and oscillatory zonings, respectively. They have different Hf isotopic values, but they give a consistent age of 218±5 Ma. These indicate that an aqueous fluid activity and a partial melting process of granitic gneiss occur at 218-219Ma.

In the northern Sulu UHP terrane, widespread migmatization domains can be observed. In the field, dark gneiss and pale gneiss show structures similar to magma mingling. Leucogranite veins locally occur in the UHP unit. (1) In the Rongcheng area, both dark gneiss and pale gneiss in a migmatite domain have protolith ages of ca 780Ma. The mantles and rims of the pale gneiss show CL features of metamorphism and partial melting origin, respectively. Their ages of 242±9 Ma and 220±4 Ma are regarded as the time of peak metamorphism and partial melting of the pale gneiss. (2) In the Weihai area, zircons from a pegmatite vein within gneiss, with clear oscillatory zonings, gave two ages of 221±7Ma and 199±Ma. Zircons from the country gneiss show a core-mantle-rim structure, the cores and rims show magmatic zircon characteristics and yield ages of 772±7 Ma and 195±4 Ma, respectively. Uniform zircon Hf isotopic values are observed in the pegmatite and the rims of the country gneiss. Thus, we interpret the age of 221 Ma as the time of pegmatite crystallization and 199 Ma as the timing of remelting of the country gneiss intruded by the pegmatite.