

# Origin of iron deposits in the Ningwu volcanic basin, Lower Yangtze River district, China: geochemical and isotopic evidence

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Ningwu volcanic basin located at the east part of the Lower Yangtze River district which is an important Cu-Au-Fe-S ore belt in association with Mesozoic magmatic rocks. A large number of iron deposits occurred in the Ningwu basin. The Washan and Dongshan deposits are two most important large deposits composed mainly of magnetite-apatite-actinolite assemblage that can be well compared with the Kiruna type iron deposits.

The major, trace, and rare earth element characteristics in apatites indicate a high  $fO_2$  environment for the crystallization of apatites and associated iron ores, possibly in an open system. Sr isotopic compositions of apatites from the Washan and Dongshan iron deposits are homogeneous with  $^{87}\text{Sr}/^{86}\text{Sr} = 0.7069$ , which are close to the initial Sr isotopic compositions of the volcanic rocks (0.7040-0.7070) and the apatites (0.7071-0.7072) from other iron deposits in the basin, and may suggest a unique magmatic fluids and ore materials in the basin scale. The  $^{232}\text{Th}$ - $^{208}\text{Pb}$  isotopes of apatite yield an age of  $124 \pm 41\text{Ma}$ , similar to the age of host volcanic rocks (127Ma). The Re-Os isotopic compositions of magnetite revealed extremely high  $^{187}\text{Re}/^{188}\text{Os}$  ratios from 112 to 26745, and high  $^{187}\text{Os}/^{188}\text{Os}$  ratios of 0.74 to 14.91, indicating a strong crustal Re fingerprint in the ore-forming system. In summary, we suggest that the ore-forming fluid may have derived from the mantle-derived gabbro-diorite porphyry magam, being the product of late-magmatic evolution with relatively high  $fO_2$  and having strong crust-mantle interaction and element mobilization.

This study is financially supported by China National Science Foundation (grants no. 40234051, 40503006, 40221301) and Ministry of Education (grant no. 306007).