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IOCG deposits on the Palaeozoic-Mesozoic continental margins: a deposit clan formed during basin inversion

Chen, H.C.[1], Han, J.S[1], Zhang, W.F.[1], Zhao, L.D.[1], and Jiang, H.J.[1]

[1]Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, Guangzhou 510640, China; huayongchen@gig.ac.cn

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IOCG deposits have been widely discovered around the world in recent years and attracted strong interest for both academia and industry. However, most identified IOCG deposits formed in Precambrian and only some in Phanerozoic, among which the Mesozoic Andean IOCG mineralization is well-known (Williams et al., 2005). With the newly-discovered Paleozoic IOCG deposits in the Central Asia Orogenic Belt, an ore genetic model for these Phanerozoic IOCG deposits developed on the continental margins was proposed and basin inversion may trigger this group of IOCG mineralization.

The Mesozoic IOCG mineralization in southern Perú and northern Chile coastal area formed in two mineralization epochs, i.e., Middle-Late Jurassic (170-150 Ma) and Early Cretaceous (130-110 Ma), and the major Cu-rich IOCG deposits are located in Early Cretaceous mineralization belt, which was formed during the Jurassic marginal basin inversion (Chen et al., 2010). Although magmatic-hydrothermal features for the iron mineralization stage is obvious, recent evidence from field, geochronology, fluid inclusions and stable isotopes show that in the major Central Andean deposits, e.g., Raúl-Condestable, Mina Justa in southern Perú, La Candelaria-Punta del Cobre and Mantoverde in northern Chile, the incursion of evaporite-sourced basinal brines or seawater may be a prerequisite for economic Cu mineralization in these deposits (Chen, 2013).

The newly defined Aqishan-Yamansu Fe-Cu mineralization belt located in the Eastern Tianshan, NW China, has been well-known in China due to its recent exploration progress on numerous Fe, Fe-Cu and Ag-Pb-Zn deposits. These deposits were mainly formed in the Late Paleozoic during inversion of the Aqishan-Yamansu back (intra) arc basin. Geological evidences show that this basin developed on the continental (Tarim Craton) margin during 350-320 Ma with accumulation of thick marine volcanic rocks but with only very few mineralization occurrence. During 320-300 Ma, the basin started to be closed with the final collision between Junggar and Tarim cratons, accompanied by intensive Fe-Cu and other polymetalic mineralization associated with regional emplacement of granitoids, including the Heijianshan, Duotoushan and Shaquanzi Fe-Cu deposits (Zhao et al., 2014; Zhang et al., 2014) which show lots of similarities to the Central Andean IOCG deposits and could be the first identified Paleozoic IOCG deposit belt in the world.

The common features for these Phanerozoic IOCG deposits, especially the two-stage model (separated Fe and Cu mineralization) accompanied with the involvement of external basinal fluids in most systems, can be reasonably related to the tectonic transformation during mineralization, i.e., basin inversion on

the continental margins during the arc evolution. In such environment, both arc magmatism and basinal fluids can facilitate mineralization.

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