# Geochemistry and genetic models for tin deposits in South China

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South China is one of the most important tin producers in the world. Except for the classical granite-related magmatic-hydrothermal tin deposits, there are many other types of tin deposits in this region, such as sediment-hosted massive sulfide type and migmatitic hydrothermal-related tin deposits. In addition, A-type granite related tin deposits are also found in South China recently.

The Dachang tin deposit in Guangxi Province is the secondary largest tin producer in China. Although some researchers have suggested that this deposit is a skarn or replacement type associated with the Yanshanian magmatic hydrothermal event, our detailed geochemical investigation including major, trace, rare earth elements, Pb, S, Sr, Nd, B, H, O, He, and Ar isotopes have indicated a submarine exhalative-hydrothermal origin for the bedded and massive sulfide ores in the deposit.

The Yunlong tin deposit in Yunnan Province is a medium-sized tin deposit, which occurs mainly as cassiterite-quartz-tourmaline ore veins hosting in a suite of metamorphic rocks and migmatite. Previously many researchers considered this deposit as a typical granite-related tin deposit, with a blind granite body at depths or it is genetically related to a S-type granite body occurring just outside the deposit. Our recent fluid inclusions, geochemical and isotopic (H-O, S, Pb, B) studies in the deposit indicated that metamorphic hydrothermal fluids generated by dehydration of the regional Chongshan group rocks were possibly responsible for the formation of this tin deposit. Hence, we proposed that the Yunlong tin deposit belongs to a new type of tin mineralization, i.e., migmatitic-hydrothermal type.

The Furong tin deposit in Hunan Province is a newly discovered large tin deposit. Tin mineralized bodies mainly occur as veins in the crush zone of the Qitianling granite that genetically related to chlorite alteration, although less important small greisen and skarn orebodies also occurred in the contact of granite with country rocks. Our study shows that the Qitianling granite is distinctly different from common S-type tin granite in the world but rather similar to A-type granite. Tin mineralization is suggested to be related to post-emplacement chloritization of the Qitianling granite. Sn-rich mafic minerals (amphibole, biotite and titanite) in the granite released tin and other metals (e.g. Ti) into the hydrothermal fluids when these minerals were altered to chlorite. Then cassiterite and rutile precipitated together when the physical and chemical condition of Sn- and Ti-rich fluids changed. It is a special model for granite-related tin mineralization.

# Geochemistry of Late Mesozoic lamprophyre dikes from the eastern North China Craton: Implications for subcontinental lithosphere evolution

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Mineral chemical, element geochemical and Sr–Nd–Pb isotopic data have been determined for the late Mesozoic lamprophyre dikes from the Jiaodong and Liaodong Peninsulas. Together with the published data, three late Mesozoic lamprophyre belts in the eastern North China Craton (NCC) could be grouped, from the Sulu Orogenic Belt towards the northwest, are the Sulu lamprophyre belt (belt 1), Guojialing–Linglong lamprophyre belt (belt 2) and Dashiqiao–Laizhou lamprophyre belt (belt 3), respectively. These lamprophyre dikes are potassic and ultra-potassic rocks and have high MgO and compatible element contents. They are all enriched in LREE and LILE and depleted in HFSE. The belt 3 lamprophyre dikes have similar Sr–Nd–Pb isotopic compositions to the EM 2-type mantle. From the belt 3 through belt 2 to belt 1, the lamprophyre dikes show a trend towards the EM 1-type mantle in terms of Sr–Nd–Pb isotopic compositions. In addition, the Sr–Nd–Pb isotopic compositions of each lamprophyre belt show a trend towards those of MORB. Furthermore, the belt 1 lamprophyre dikes have super-chondritic Nb/Ta ratios (>17.5) whereas the belt 2 and belt 3 lamprophyre dikes show sub-chondritic Nb/Ta ratios (<17.5). All these features, together with comparison to the Late Triassic (201 Ma) Sulu mafic dikes that have similar Sr–Nd isotopic compositions to the EM 1-type mantle and also show super-chondritic Nb/Ta ratios, suggest that the eastern NCC lithospheric mantle near the Sulu Orogenic Belt was hybridized by the melt derived from the subducted Yangtze continental slab during the Triassic collision of the Yangtze Craton with NCC and then all the subcontinental lithosphere beneath the eastern NCC was metasomatized by slab-derived fluid during the late Mesozoic Palaeo-Pacific plate subduction. Detailed elemental and isotopic data, together with our recent studies on the origin of the late Jurassic (160−153 Ma) Linglong suite and Early Cretaceous (130−126 Ma) Guojialing suite in the northwestern Jiaodong Peninsula, also suggest that the Early Cretaceous lamprophyre dikes were derived from partial melting of the delaminated lithospheric mantle plus additional input from the upwelling asthenospheric mantle. Such a delamination is a consequence of the progressive slab roll-back associated with the subduction of the Palaeo-Pacific plate.

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