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Osmium-Zinc isotope constraints on the formation of chromitites in the Yarlung-Zangbo ophiolitic belt in Tibet, China

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The Yarlung-Zangbo Suture Zone (YZSZ) is the southernmost and youngest suture zone in the Tibetan Plateau, separating the Eurasia plate to the north from the India plate to the south. Ophiolitic massifs of varying areal extents are distributed discontinuously along the east-west trending YZSZ and are commonly interpreted to be relics of the Neo-Tethys Oceanic lithosphere. Traditionally, the Yarlung-Zangbo ophiolitic belt is geographically divided into three segments, including, from east to west, (1) the eastern segment, including the Luobusa and Zedang ophiolites; (2) the central segment, including the Xigeze, Sangsang, and Saga ophiolites; and (3) the western segment, including the Zhongba, Xiugugabu, Purang, and Dongbo ophiolites in the southern sub-belt, and the Cuobuzha, Baer, and Dajiweng ophiolites in the northern sub-belt. Chromitites or chromite mineralization of varying degrees have been discovered in the Luobusa, Zedang, Xigaze, Purang, Dongbo, Cuobuhza, Baer, and Dajiweng ophiolites. The high-Cr variety dominates the Yarlung-Zangbo chromitites, with rare high-Al chromitites reported in the Dongbo and Purang ophiolites. The sampled chromitites in this study are exclusively of high-Cr type. Using empirical equations, the calculated parental magmas that formed the YZSZ chromitites are broadly similar to boninitic melts. Rhenium (Re) and Osmium (Os) concentrations vary considerably within the YZSZ chromitites, with Os ranging from 15 ppb to 649 ppb, and Re ranging from 0.07 ppb to 7.47 ppb. These concentrations are within the variation range of chromites separated from worldwide chromitites. $^{187}Os/^{188}Os$ ratios of chromites from the YZSZ chromitites range from 0.12525 to 0.12933, which are lower than the proposed present-day $^{187}Os/^{188}Os$ values for the primitive upper mantle. The T_{RD} age variation of the YZSZ chromitites from late Neo-Proterozoic to early Triassic thus reflects that their parental magmas are derived from depleted mantle sources mixed with diachronous ancient mantle domains. The YZSZ chromitites span a relatively wide range in $\delta^{66}Zn$ from -0.04 ‰ to 0.23 ‰, with an average of 0.14 ± 0.08 (n=13, 1sd). The light Zn isotopic compositions indicate that subducted serpentinites have contributed to the parental magma of the YZSZ chromitites.