Iron isotopes constrain the origin of the Luobusa ophiolite, southern Tibet

YAN XIAO[1], BEN-XUN SU[1], MEI-FU ZHOU[2], BIN ZHU[1], REN-DENG SHI[3], QI-SHUAI HUANG[3], XIAO-HAN GONG[3] AND YONG-SHENG HE[4]

[1]State Key Laboratory of Lithospheric Evolution, Institute of Geology and Geophysics, Chinese Academy of Sciences
[2]Department of Earth Sciences, the University of Hong Kong, Pokfulam Road, Hong Kong, China
[3]Key Laboratory of Continental Collision and Plateau Uplift, Institute of Tibetan Plateau Research, Chinese Academy of Sciences, China
[4]State Key Laboratory of Geological Processes and Mineral Resources, China University of Geosciences, China

High-precision Fe isotopic compositions of olivine, orthopyroxene and chromite separates from harzburgites, dunites and chromitites in the mantle section of the Luobusa ophiolite, southern Tibet were determined to constrain the origin of podiform chromite-bearing ophiolite. The Fe isotopic compositions of mineral separates from the Luobusa ophiolite are variable, with δ^{56}Fe ranging from -0.146 to 0.215‰ in olivine, from -0.034 to 0.060‰ in orthopyroxene and from -0.247 to 0.043‰ in chromite, respectively. The δ^{56}Fe of olivine from Luobusa harzburgites and dunites correlates positively with its Fo content, likely reflecting melt-rock reaction. Chromite in different types of Luobusa chromitites has variable Fe isotopic composition. The disseminated chromitite has lighter Fe isotopic composition (δ^{56}Fe=-0.247‰) than the massive chromitite (δ^{56}Fe=0.043‰). The δ^{56}Fe isotopic ratio of banded and nodular chromitites is intermediate and ranges from -0.156 to -0.079‰. From massive, nodular, to banded and then to disseminated chromitites, the $\delta^{56}Fe_{Chr}$ decreases with the decreasing $Fe^{3+}/\sum Fe$ ratio and MgO, and with the increasing FeO of chromite, indicating that changes in mantle oxygen fugacity, coupled with melt-rock interaction and crystallization, could be responsible for generating above trends. Therefore, these chromitites are most likely formed from precipitation of hydrous magma that migrates through upper mantle.