Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.17305

Neoproterozoic carbonatitic magmatism along NW margin of the South China craton and its implications for recycled sedimentary component

LI ZHEHUA

China University of Geosciences (Wuhan)

Presenting Author: 1534610637@qq.com

The Lijiahe carbonatite is located in the NW Yangtze block, it is the oldest and the largest ($0.32km^2$) known cabonatitic intrusion in the South China craton. Although most carbonatites form intrusive complexes in association with alkaline silicate rocks, their petrogenesis has long been controversial.

Here we report a comprehensive investigation of Sr-Nd-Ca isotopes and elemental geochemistry on the Lijiahe intrusion. In spite of several times of apatite U-Pb dating efforts, qualified ages have not been obtained. However, constraints from age spectra of the dating data and the urtite-jacupirangite enclaves hosted by the carbonatite suggest that the Lijiahe intrusion formed during late stage of the alkaline magmatism of the Pinghe ultramafic complex occurring at the same area, which was dated at ~870Ma (U-Pb zircon). The carbonatitic rocks are sövite in lithology dominated by calcite with minor minerals of magnetite (5-45vol%), pyrite, apatite, sahlite and biotite. The Lijiahe intrusion displays wide ranges in CaO (18.8-51.7 wt.%) and $Fe_2O_3^t$ (1.34~61.5 wt.%), and low contents in silica (<4.18 wt.%) and total alkalis (<0.13 wt.%). They are depleted in HFSE (Nb, Ta, Ti, Zr and Hf) and LILE (Rb, Ba, K and U) and enriched in LREE. The samples have $\delta^{44/40}Ca_{NIST915a}$ values of 0.72‰~0.91‰, which are evidently lower than that of the average bulk silicate Earth (0.94 ± 0.05‰) and indicative of involvement of recycled/subducted marine carbonates. They show initial $^{87}Sr/^{86}Sr$ ratios of 0.7040-0.7062 (average 0.7043) and ε_{Nd} (870Ma) values of +3.0 - +1.5 (average +2.3), suggestive of a moderately depleted mantle source.

The decoupled isotopic signature above is explained by interactions of source rocks with melts derived from the recycled carbonate with light Ca isotope composition, whereas their depleted affinity in incompatible elements was basically unaffected. We suggest that mantle plumes played a significant role to the alkaline magmatism of the carbonatite-silicate complex, which initiated the rift and separating of the South China craton from Rodinia supercontinent.