

The origin of Pobei Cu-Ni sulfide bearing ultra-mafic complexes in Xinjiang, China: Envidences from volatiles, carbon and noble gas isotopes

QINGYAN TANG¹, MINGJIE ZHANG¹, MING YU¹,
CHUNHUI CAO², ZHONGPING LI², LI DU²

¹ School of Earth Sciences, Lanzhou University,
Lanzhou 730000, China (tangqy@lzu.edu.cn)

² Lanzhou Centre of Oil & Gas Resource Research,
Chinese Academy of Sciences, Lanzhou 730000,
China

A number of Permian mafic-ultramafic layered complex that host Ni-Cu sulfide mineralization occur in the Beishan, northeastern Tarim Craton, Xinjiang, NW China. The chemical, carbon and noble gas isotopic compositions of volatiles in pyroxene of Poyi mafic-ultramafic intrusion have been measured to reveal the origin, evolution and metallogenesis of the intrusion.

The volatiles of pyroxene in Poyi ultramafic rocks are mainly composed of H₂O (av. 59 vol. %) and H₂ (13), with minor CO₂ (3) and CO (2). $\delta^{13}\text{C}_{\text{CO}_2} = -13.91\text{‰}$, $\delta^{13}\text{C}_{\text{CH}_4} = -11.54\text{‰}$. The $\delta^{13}\text{C}$ values of CH₄, C₂H₆, C₃H₈ and C₄H₁₀ showed the partial reversal distribution pattern with carbon number. The pyroxene separates have ³He/⁴He ranging from 1.13 to 6.15 Ra (av. 2.90 Ra) and ⁴⁰Ar/³⁶Ar from 326.4 to 1004.3 (av. 530.4).

The $\delta^{13}\text{C}$ of CO₂ and CH₄ were plotted in the $\delta^{13}\text{C}$ range of crust, carbonate and mantle. The ³He/⁴He and ⁴⁰Ar/³⁶Ar ratios are between the air/oceanic sediments and mantle plume. Carbon and noble gas isotopes indicate that the sedimentary organic materials, and altered oceanic crust have added into the mantle plume magma.

The Beishan region was a Late Paleozoic rift probably developed in association with the mantle plume activity in the Tarim Basin. The Poyi intrusion shows flat REE patterns and pronounce negative Nb anomalies relative to Th and Ta, Nd, Sr, Hf isotopic data suggested the hypothetical mantle plume model (Pirajno et al., 2008; Su et al., 2012), and the cycling of subducted sediments have added into the early Permian mantle plume during the formation of Poyi Ni-Cu sulfide bearing complex. These evidences support the volatile conclusion.

Acknowledgments: This study is supported by NSFC (41472070, 41372095) and Fundamental Research Funds for the Central Universities (Izujbky-2015-64).

References:

- [1] Pirajno *et al.* (2008) *J. Asian Earth Sciences* **32**, 165-183.
- [2] Su *et al.* (2012) *Lithos* 134-135, 41-51.