Iron and Vanadium isotopic compositions of Cenozoic basalts from Eastern China

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Because iron (Fe) and Vanadium (V) have multiple valence states and are sensitive to oxygen fugacity, their isotopic compositions may be fractionated during partial mantle melting. In order to explore the isotopic fractionation mechaism during partial melting, we analyzed Fe and V isotopic compositions of Cenozoic alkaline and tholeiitic basalts from the Eastern China.

δ^{56}Fe values of these basalts range from +0.09 to +0.28‰, which are significantly higher than the value of fertile upper mantle (δ^{56}Fe = +0.02 ± 0.03‰)[1], and reltively higher than the values of MORBs (δ^{56}Fe = +0.11 ± 0.04‰) and OIBs (δ^{56}Fe = +0.12 ± 0.07‰)[2]. Similarly to iron isotopes, δ^{51}V values of these basalts range from -0.75‰ to -0.51‰, which are also higher than those of bulk silicate earth (δ^{51}V = -0.70 ± 0.20‰) and MORBs (δ^{51}V = -0.95±0.13‰)[3].

As the mantle sources of Cenozoic basalts from Eastern China were probably oxidized by interaction of carbonatitic melts derived from a subductioned oceanic slab with the mantle[4], this process may cause the the enrichment of Fe^{3+}, V^{4+}, and V^{5+} in the melt with the eleveated fo_2. Consequently, heavy Fe isotopes and V isotopes preferentially enter into the melt. In summary, we suggest that the oxidation state may be the key role in controlling the iron and vanadium isotopes fractionations during partial mantle melting.

1. Weyer et al., EPSL 259, 119-133 (2007).
2. Teng et al., GCA 107, 12-26 (2013).
3. Prytulak et al., EPSL 365, 177-189 (2013).
4. Huang et al., GCA 164, 298-317 (2015).