

Petrogenesis of the olivine-oxide-rich layered intrusion associated with Proterozoic Damiao anorthosite complex, China: Implications for parental magma composition

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An uncommon olivine-oxide-rich layered intrusion is revealed beneath Proterozoic Damiao anorthosite complex by deep drilling, which is in fault contact with overlying Damiao anorthosite, and is intruded by underlying Paleozoic ultramafic intrusion. It has a buried depth from 696 m to 2170 m under the surface ^[1, 2]. This layered intrusion is sill-like body that strikes N-E with controlled extension of 1000 m and dips S-E at about 30° with controlled depth of 1020 m ^[1, 2]. It is composed of alternating olivine-oxide-rich dark layers and plagioclase-rich light layers.

Precise SIMS baddeleyite Pb-Pb dating of the gabbro-norite in the light layers constrains an emplacement age of 1736.4±3.1Ma. This age is consistent with the latest emplacement age (1733.8±7.3Ma) of the Damiao anorthosite complex, as constrained by baddeleyite Pb-Pb dating of the most evolved vein-like nelsonite. Close field relations, similarities in REE patterns and overlapping Nd-Hf isotopic compositions between this layered intrusion and Damiao anorthosites indicate that they formed by differentiation from a common parental magma. The narrow age span of emplacement indicates a short-lived magma chamber. Based on well-defined linear compositional trends, the composition of the parental magma is estimated as ferrobasaltic, from which high-Al basaltic magma that generally considered as directly parental to anorthosites is evolved. The olivine-oxide-rich layered intrusion represents the detached complementary mafics.

[1] Fan *et al.*(2014) Hebei Geology, **2**, 29-32.

[2] Han *et al.*(2014) Hebei Geology, **3**, 2-4.