

SCIENTIFIC COMMUNICATIONS

A MAGNETITE-APATITE DEPOSIT IN THE FANSHAN ALKALINE ULTRAMAFIC COMPLEX, NORTHERN CHINA

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Abstract

The Fanshan alkaline ultramafic complex, which has a length of 6 km and a width of 5 km in plan view, consists of three zones from its core to margin (zones 1–3). The middle zone (zone 2) is the oldest intrusive phase and is ultramafic. The outer zone (zone 3) and the inner zone (zone 1) are alkaline. The three zones have essentially the same mineralogy, but zone 2 is distinct in its compositional layering and cumulate texture. The magnetite-apatite orebodies occur in the middle part of zone 2 and are characterized by typically two or three layers of apatite rock, each less than 3 m thick, and one layer of magnetite-apatite rock about 7 m thick.

The complex is characterized by high K₂O contents (up to 12 wt %) but low SiO₂ (<50 wt %). Except for the apatite layers, whole-rock major elements of the three zones show coherent variations on Harker diagrams and all rocks show quite similar chondrite-normalized rare earth element (REE) patterns, suggesting that they were derived from a common parent magma. However, the contacts between the three zones indicate that several batches of magma were intruded to form the three zones. Mineral compositions and REE patterns support in situ fractional crystallization as the origin for the oxide-apatite layers. The strongly variable oxide/apatite ratios argue against liquid immiscibility being directly responsible for the formation of the oxide-apatite rocks. However, liquid immiscibility may have taken place in the magma chamber under high pressure and temperature conditions at depth, resulting in a low-silica and an Al-, Fe-, Mg-, Ca-, P- and volatile-rich immiscible melt being intruded first as zone 2.

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