

**Silicate and Carbonatite melt  
metasomatism in the lithospheric  
mantle beneath northeast China:  
Constraints from mantle xenoliths in  
Cenozoic basalt**

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The evolution of the lithospheric mantle beneath northeast China is not well constrained. We report three types of pyroxenites and some metasomatized peridotites including a wehrlite from the Shuangliao and Jiaohe regions, northeast China. These samples record silicate and carbonatite melt metasomatism that modified the lithospheric mantle. Group 1 pyroxenites with high Al<sub>2</sub>O<sub>3</sub> and Mg#, positive Eu and Sr anomalies, and olivine δ<sup>18</sup>O of 4.8–5.1‰, were formed by reaction of peridotites with melts extracted from subducted crust. Group 2 pyroxenites have peridotite-like compositions of pyroxenes, and were formed by reactions of lithospheric peridotites with silicate melts derived from the asthenosphere. Group 3 pyroxenites contain orthopyroxene surrounded by fine-grained olivine and clinopyroxene, or have chemically zoned clinopyroxene, which were resulted from recent infiltration of a carbonatite melt originated from carbonated asthenosphere. Clinopyroxenes of some metasomatized peridotites are enriched in Sr and light rare earth elements, and depleted in Nb, Zr, Hf and Ti. The clinopyroxene of the wehrlite has high Mg# and Na<sub>2</sub>O, and shows chemical and Sr isotopic zoning, consistent with a recent infiltration of a dolomitic carbonatite melt.

We suggest that subducted crustal materials were initially transported to the asthenosphere beneath northeast China to produce carbonate-bearing domains. Upwelling of the carbonated asthenosphere produced carbonatite melts that migrated upwards and metasomatized the overlying lithospheric mantle.

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