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Wehrlitisation in the upper mantle beneath the Nógrád-Gömör Volcanic Field (Northern Pannonian Basin)

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The Nógrád-Gömör Volcanic Field is situated in the northern part of the Pannonian Basin, where Plio-Pleistocene alkaline basalts brought upper mantle xenoliths to the surface. We collected great number of ultramafic xenoliths from the central part of the region, Medves-plateau (Eresztvény, Magyarbánya) and Baby hill (Ratka, Filakovske Kovace, Terbelovce), and detailed petrographic studies were carried out. As a result, beside the dominating lherzolite xenoliths, large number of wehrlite xenoliths also appeared, in which the modal proportion of clinopyroxene was increased in contrast to the descending amount of ortopyroxene. These wehrlite xenoliths show very unique texture, which is characterized by irregularly shaped olivine grains hosted in clinopyroxene and vermicular spinel inclusions in clinopyroxenes.
According to petrographic features, ten wehrlite xenoliths have been selected for a detailed study. Based on the major elements of rock forming minerals, Fe and Mn enrichment in olivines, Ti, Al and Fe enrichment in clinopyroxenes, and Fe and Ti enrichment in spinels can be observed compared to those of lherzolite xenoliths.
In the studied wehrlite xenoliths silicate, fluid and sulfide inclusions are also abundant. We focused on the latter ones in this thesis. The mineralogy of these multi-phase sulfides is in agreement with those usually found in the upper mantle with domination of pyrrhotite, pentlandite and chalcopyrite. However, bulk composition of the sulfides slightly differs from the lherzolite xenoliths. Sulfides in wehrlite xenoliths show higher Fe and lower Cu concentrations.
Based on our detailed petrography and geochemistry of rock forming constituents and sulfide minerals, wehrlite xenoliths are products of a process called stealth mantle metasomatism where new minerals, in our case clinopyroxene is introduced to the system that is mineralogically indistinguishable from common upper mantle peridotites. This metasomatism is supposed to be caused by a mafic melt agent with high MgO/FeO ratio, which is different from the host alkaline basalt.