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Geochemical features of hydrated mantle peridotite xenoliths from the Green Knobs diatreme, USA

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Mantle peridotites beneath the Colorado Plateau have been well documented by several workers (e.g. McGetchin and Silver, 1972; Smith and Levy, 1976), and are mostly spinel-garnet lherzolite to harzburgite with minor garnet peridotites. They are characterized by the presence of hydrous minerals, i.e. amphiboles (pargacite to tremolite and sodic tremolite), chlorite, titanoclinohumite and antigorite. There has been a controversy about the source of fluids responsible for the hydration. We determined trace-element characteristics of all constituent minerals of hydrated peridotite xenoliths from the Green Knob diatreme (kimberlitic breccia) to constrain the origin of the fluids.
We examined selected 8 ultramafic xenoliths (3 lherzolites, 3 harzburgites, 1 websterite, and 1 orthopyroxenite), which contain various hydrous minerals (amphiboles, chlorite and titanoclinohumite). The main rock types of the xenolith from Green Knobs are granite, metamorphic rocks, and ultramfics, only 1 % in volume of all (Smith and Levy, 1976). These xenoliths contain sulfide globules, and ilmenite grains are also rarely observed. The chondrite-normalized REE patterns of clinopyroxene slope gently from HREE (Lu) to MREE (Sm) and are high in LREE. Some clinopyroxenes are enriched in Sr and other LILE but depleted in HFSE, i.e. Zr and Ti. These features are inherited from the metasomatic agent. The trace-element abundances of all clinopyroxenes are almost the same except one lherzolite sample that contains garnet pseudomorphs.
We try to discuss the metasomatic event, especially in hydration process, beneath Green Knobs from the geochemical features.

Keywords: peridotite xenoliths, mantle wedge, hydration, mantle metasomatism