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PGE-rich clays in a mantle peridotite xenolith from Avacha volcano, the southern Kamchatka arc

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Platinum-group elements (PGE) have strongly refractory features within the mantle peridotite/melt system, and favor sulfides or metals (such as the earth's core). In addition, these PGE are not mobile during weathering and/or low temperature alteration processes. We found unusually high-Ni, Fe clays in a highly metasomatized mantle peridotite xenolith (sample #159) from Avacha volcano, the southern Kamchatka arc. The sample #159 contains Ni-rich spots, composed of mantle minerals with high-Ni contents: NiO contents of olivine, orthopyroxene, and chromian spinel is up to 5.3 wt%, 1.1 wt% and 1.1 wt%, respectively, there. The high-Ni, Fe clays are located at the center of the Ni-rich spot, and the Ni content of minerals decreases from the center outward. The high-Ni, Fe clays are brownish-yellowish in color under the microscope. Some of the clays are also quite rich in S (? 66,000 ppm). The Ni/(Fe+Ni) atomic ratio of the clay is highly changeable (0-0.7), and does not show any correlation with the S content. However some incompatible trace elements (Nb, Sr, Zr and Ti) are strongly depleted in the high-Fe, Ni clays, their rare earth element features are similar to those of Avacha silicic glasses and/or the host andesite. In addition, some clays show extremely PGE enriched features, and the concentrations of Os, Ir and Ru in the clays are 106 times higher than the chondrite values. Geochemical features of minerals around the high-Ni, Fe clay clearly indicate that the clays are an alteration product from the metasomatic agent that drastically enhanced the Ni content of surrounding minerals. Possible candidate of the metasomatic agent is sulfide, but we can deny the possibility because there is no Ni enrichment halo around intact sulfides in sample #159. We propose that the high-Ni, Fe clays were peculiar silicate melt or silicate-bearing aqueous fluid with high concentrations of Ni, Fe, S and PGE, and it possibly plays an important role in mobilization of transition elements and PGE within the mantle wedge.

Keywords: platinum-group elements, transition elements, peridotite xenolith, mantle wedge