Mantle-derived crichtonite-group minerals: An insightful means to study deep-seated processes

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Crichtonite-group minerals (CGM) are exotic titanates with the general formula $ABC_{18}T_2(O,OH)_{38}$. They occur as accessory phases in a variety of magmatic, metamorphic, metasomatic and hydrothermal mineral assemblages both of crustal and upper mantle origin. Their most prominent feature is a characteristic enrichment in a wide array of incompatible elements (LILE, HFSE, REE), which allows CGM to control the trace-element budget of a bulk mineral paragenesis.

Over the past few years, the authors have been investigating CGM in a mantle-derived cargo of kimberlites Internatsionalnaya, Udachnaya, Mir, Obnazhennaya and lamprophyres of the Aldan shield. In contrast to South Africa, where CGM are commonly found as lindsleyite-mathiasite (LIMA) series in metasomatized peridotite xenoliths, the examined Siberian CGM are mostly inclusions in pyrope [1-3] and enstatite [4]. The studied pyrope-hosted CGM are chromium titanates with Ca, Sr and ocassionally Ba dominating in the A site, while enstatite-hosted CGM are Ba- and K-specific. Of particular interest are two potentially new (Sr-characteristic) CGM members discovered in pyropes from the Internatsionalnaya mine [1].

CGM occurences in mantle assemblages offer important petrological-geochemical implications to the migration and evolution of deep-sourced metasomatizing melts/fluids charged with incompatible elements. P-T estimates for the studied CGM-bearing associations span the range ~650-850 °C and ~25-42 kbar, indicating that metasomatism affected mainly coarse-grained lithologies at moderate mantle depths (~80-120 km). Future studies will deal with the micro-Raman examination of CGM [3], isotopic dating and evaluation of CGM application in diamond exploration.

[1] Rezvukhin *et al.* (2018) *Lithos* 308-309, 181-105. [2] Nikolenko *et al.* (2017) *J. Raman Spectrosc.* 48, 1597-1605. [3] Alifirova et al. (2019) *J. Raman Spectrosc.* (under revision). [4] Rezvukhin *et al.* (2019) *Am. Min.* 104, doi 10.2138/am-2019-6741.

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