

**New olivine-phyric shergottites, Larkman Nunatuks
(LAR) 12011, 12095, 12240**

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Introduction: Three new olivine-phyric shergottites, LAR 12011, 12095, 12240, were found during the 2012 ANSMET expedition [1]. Preliminary classification in [1] has suggested that LAR 12011 differs from LAR 12095 and 12240, but is similar to LAR 06319. Here, we report our study of these three samples (thin and grain mounts).

Methods: Thin- and thick-sections were allocated by the JSC MWG. Mineral chemistry and X-ray mapping were performed using a Cameca SX-100. A laser fluorination technique was used to obtain the oxygen isotope compositions of the three samples at UCLA.

Results: As described in [1], all three samples display an olivine-phyric texture, although LAR 12011 is much darker in color. This is mainly a result of black to blackish brown colored olivine in LAR 12011. All samples display shock veins and melt pockets. The oxygen isotope compositions of these samples are: $\delta^{18}\text{O} = -4.3\text{‰}$, with a range of $\pm 0.1\text{‰}$, and $\Delta^{17}\text{O} = -0.31\text{‰}$ with a range of $\pm 0.02\text{‰}$, confirming a martian origin.

LAR 12011. Olivine in the LAR 12011 section ranges from Fo₇₇ to Fo₄₀, and is of a slightly more Fe-rich composition than those in LAR 06319 [2, 3]. Pyroxenes display concentric zoning from low-Ca to high-Ca and then to lower Ca higher Fe compositions, which are also similar to that in LAR 06319 [3]. Maskelynite forms radiating clusters between Fe-Mg minerals, and displays a limited range of composition (An₅₀₋₄₂). Oxides in LAR 12011 show a normal zoning from a chromite core toward an ulvöspinel rim. This sample contains mesostasis of K-rich feldspars, silica, and ilmenite/magnetite, similar to LAR 06319 [2]. In summary, LAR 12011 is paired with LAR 06319, as an additional ol-phyric shergottite stone in the enriched group.

LAR 12095 and 12240. These two samples are of light gray color and similar to each other. Significant terrestrial weathering is present in a ~2 mm thick zone near the fusion crust. Olivine compositions range from Fo₇₂ to Fo₅₈, comparable to DaG 476. Pyroxene laths can range up to 1 to 1.5 mm in length. Except for these large pyroxenes, smaller grains do not display concentric zoning. The compositional ranges in pyroxenes in these samples are similar to DaG 476/489 without Fe-rich low-Ca augite compositions [4]. Maskelynite in both samples have a composition of An₆₈ to An₅₀. Although oxides in these samples display a gradual zonation from chromite to Ti-rich, they also display abundant exsolution lamellae in the rim. LAR 12095 and 12240 likely belong to the depleted shergottite group.

References: [1] Antarctica Meteorite Newsletter, 36, 2. [2] Basu Sarbadhikari, A. et al. (2009) GCA, 73, 2190-2214. [3] Peslier, A. et al. (2010) GCA, 74, 4543-4576. [4] Meyer, C. (2012) Martian meteorite compendium, <http://curator.jsc.nasa.gov/antmet/mmc/>