Pufahl Research Group

LAC À L'ORIGNAL MINERALOGY Research Notes

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Samples from First Phosphate's Lac à l'Orignal deposit are part of the Proterozoic Lac-Saint-Jean Anorthosite (LSJA) Complex. Lac à l'Orignal is situated ~250 km N of Quebec City. The samples are primarily composed of plagioclase (10 to 98 wt.%), orthopyroxene (5 to 36 wt.%), magnetite (3 to 18 wt.%), ilmenite (1 to 10 wt.%), apatite (2 to 22 wt.%), and biotite (2 to 19 wt.%); modal compositions are based on Rietveld analysis of the sample suite. Most samples possess alternating plagioclase-rich (leucocratic) and mafic and oxide-rich (melanocratic) cumulate layering.

Apatite occurs as individual crystals in magnetite and ilmenite-rich layers (Fig. 1), individual crystals associated with plagioclase (Fig. 2) and orthopyroxene (Fig. 3), and as inclusions within orthopyroxene (Figs 3 to 5). All apatite crystals are generally elongate and range from 0.1 to >1 mm along their long axes (Fig. 6; Table 1). Apatite crystals associated with plagioclase and orthopyroxene, and occurring as inclusions within orthopyroxene are euhedral to subhedral. Apatite crystals within magnetite and ilmenite-rich layers are generally subhedral to anhedral.

Plagioclase crystals exhibit two dominant size distributions, 1 mm and ≥ 10 mm. Orthopyroxene crystals also exhibit size variations ranging from 0.1 to ≥ 2 mm (Table 1). Although biotite does not occur in all samples, when present, crystals range from 0.2 to 2 mm along their long axes (Fig. 6; Table 1). Trellis texture produced by the exsolution of ilmenite within magnetite is commonly observed in oxide phases. The magnetite crystals are euhedral, ranging from 0.1 to ≥ 10 mm in width, and when occurring as exsolution laminae of ilmenite are elongate, ranging from 0.1 to 2 mm in length (Table 1).

	Crystal size (mm)	Number of measured crystals (n)
plagioclase	1 to ≥10	15
orthopyroxene	0.1 to ≥2	15
magnetite	0.1 to ≥10	13
ilmenite	0.1 to 2	12
apatite	0.1 to ≥1	25
biotite	0.2 to 2	14

Table 1. Crystal size distribution from samples of First Phosphate's Lac à l'Orignal deposit.

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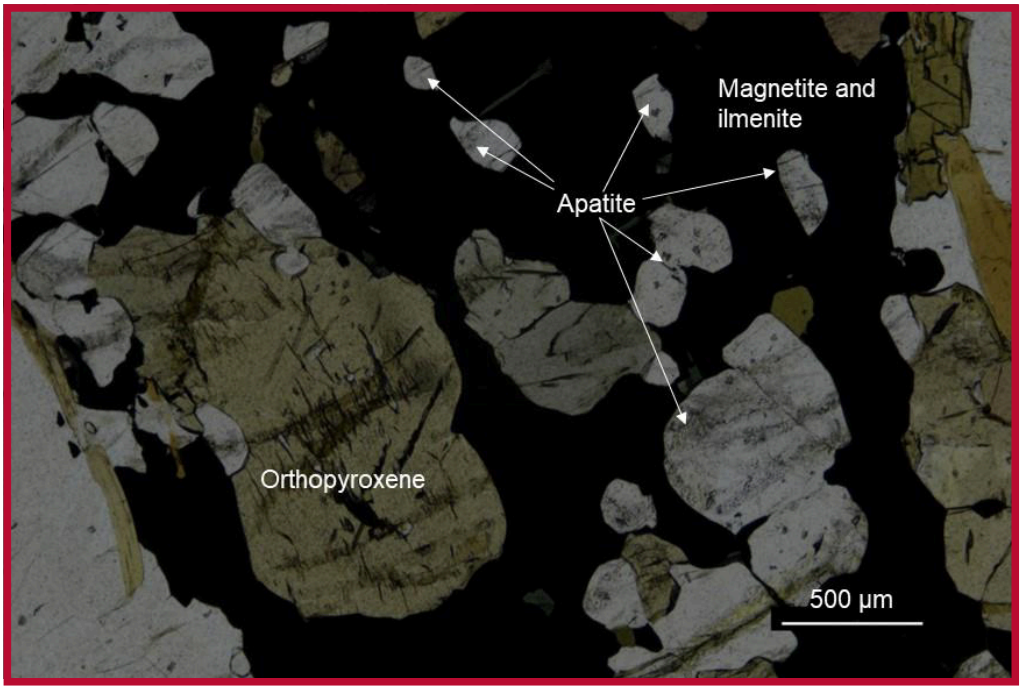

Fig. 1. Photomicrograph of a representative sample from the Lac à l'Orignal deposit showing apatite crystals with varying size distributions within a magnetite-rich and ilmenite-rich layer (plane-polarized light).

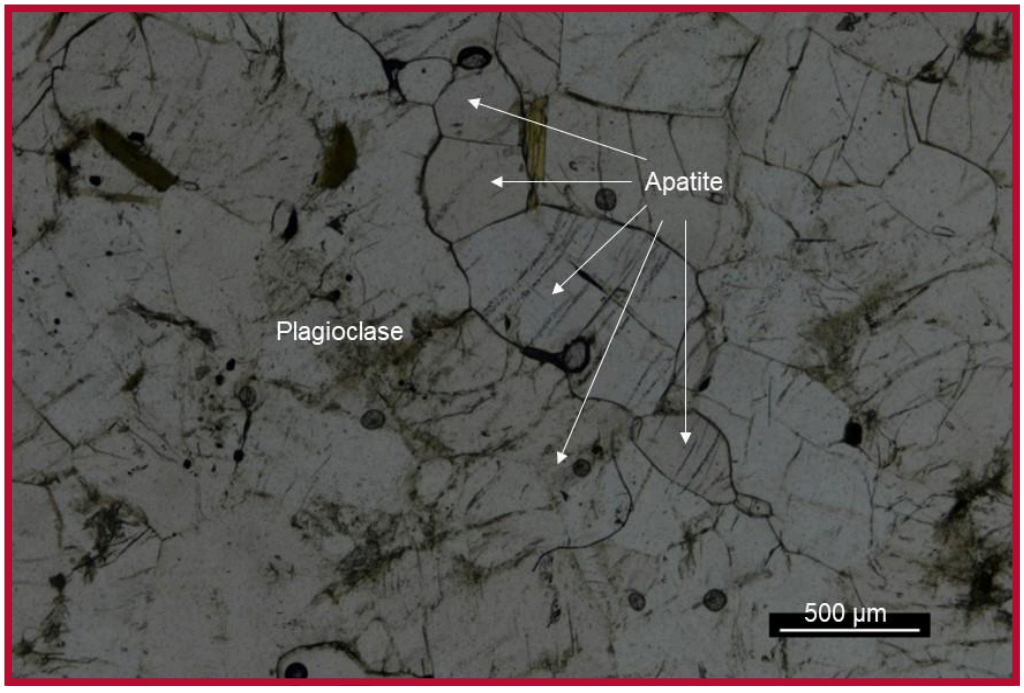

Fig. 2. Photomicrograph of a representative sample from the Lac à l'Orignal deposit showing apatite crystals associated with plagioclase (plane-polarized light).

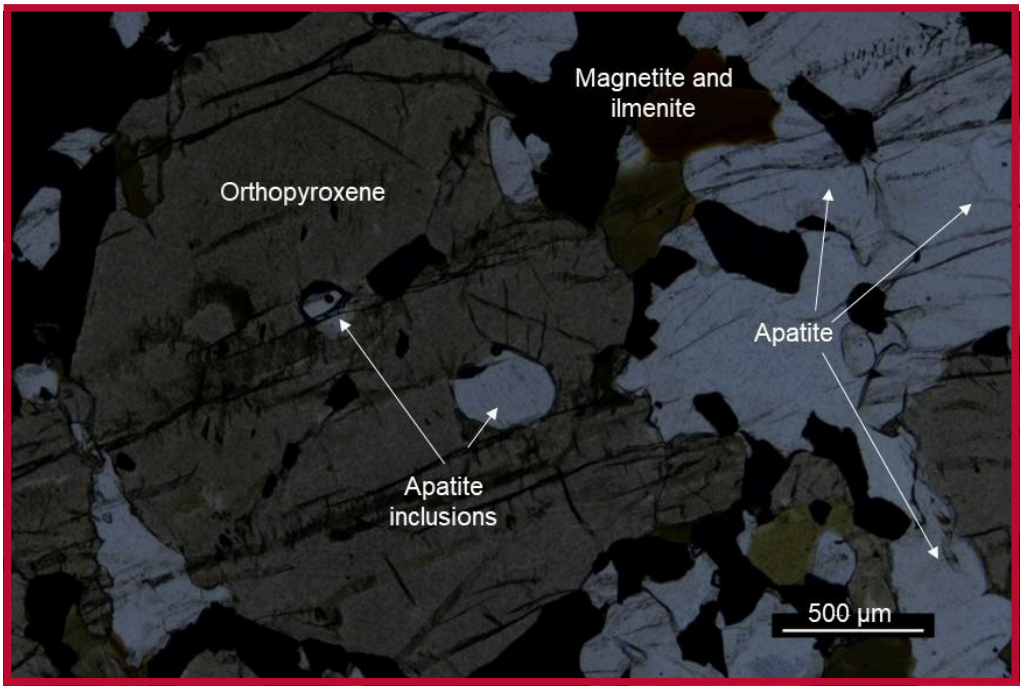

Fig. 3. Photomicrograph of a representative sample from the Lac à l'Orignal deposit showing apatite crystals associated with orthopyroxene (plane-polarized light). Apatite inclusions are also present within the orthopyroxene.

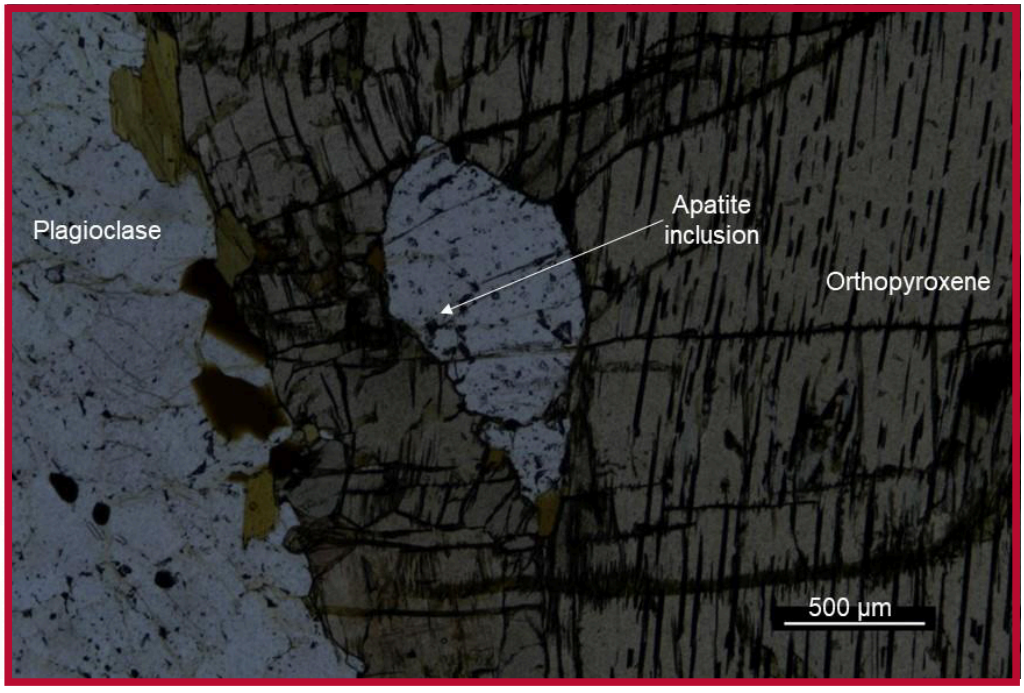

Fig. 4. Photomicrograph of a representative sample from the Lac à l'Orignal deposit showing an apatite inclusion within orthopyroxene (plane-polarized light).

Fig. 5. Photomicrograph of a representative sample from the Lac à l'Orignal deposit showing various sizes of apatite inclusions within orthopyroxene (plane-polarized light).

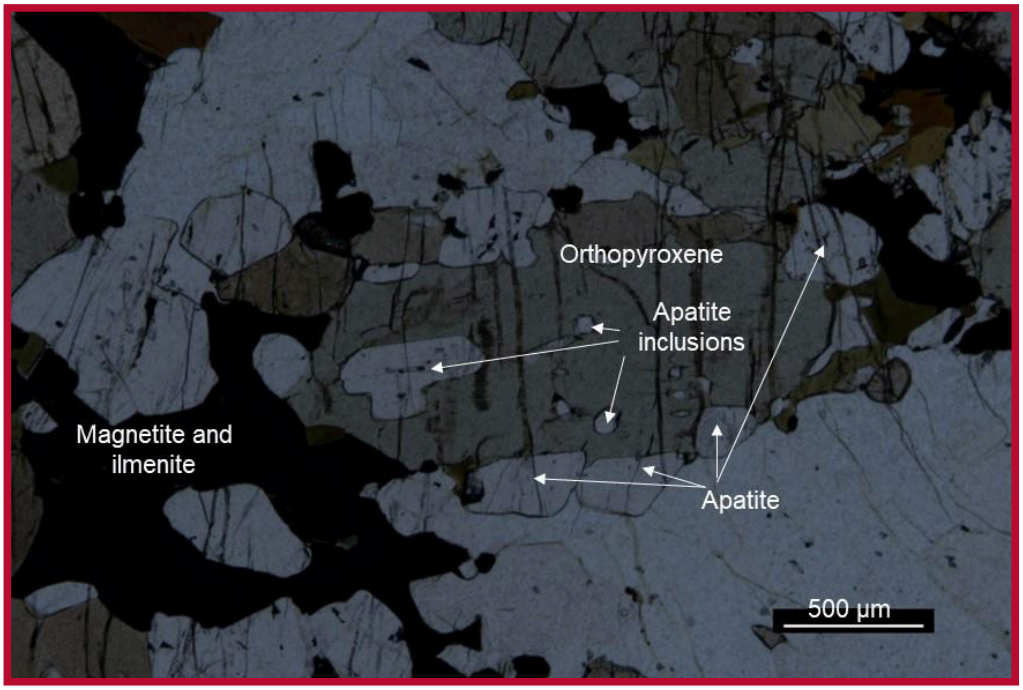

Fig. 6. Photomicrograph of a representative sample from the Lac à l'Orignal deposit showing biotite and apatite crystals (plane-polarized light).