

Characterisation of the Rare Earth Elements in Apatite of the Lac À Paul P-Ti Deposit, Saguenay-Lac-St-Jean, Québec

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The Lac à Paul P-Ti deposit is situated in the North of the 1.1 – 1.0 Ga Saguenay-Lac-St-Jean anorthosite. The deposit is currently owned by Arianne Phosphate Inc., and is in an advanced exploration stage. The ore extracted will consist of mostly nelsonitic peridotite, a rock composed of 30-50% iron oxides, 10-25% apatite, and 10-25% olivine. Two ore zones have been identified thus far: 1) the northern unit; composed of fine-grained nelsonitic peridotite (7-12% P₂O₅), and 2) the southern unit; composed of coarse-grained to megacrystic nelsonitic gabbro-norite (4-6% P₂O₅). Between the ore zones, there is a unit containing both rock types, either in a layered succession or as a coalescent mix. Multiple ferrodioritic dykes were also identified in the area, which may be cogenetic with the ore units. This study aims to determine if the rare earth elements (REE) are predominantly hosted in the apatite, and if their distribution is homogeneous or identify the factors that influence an inhomogeneous distribution. This information will help determine the REE composition of the parental melt, and whether the different units are cogenetic. To achieve the goals, electron microprobe (EMP) and laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) analyses were conducted on samples collected throughout the deposit. Analyses of isotopic compositions of Sm-Nd and Rb-Sr pairs were done on 9 apatite concentrates to provide more information regarding the cogeneticity of the different units. This is all done to further our understanding of the formation of P-Ti deposits, and to test the viability of the method for future studies. The study is part of a research program on REE in the province of Quebec initiated by the DIVEX innovation network (Diversification de l'Exploration Minérale au Québec) and the MERN (Ministère de l'Énergie et des Ressources naturelles du Québec).