

In-situ Gamma-Ray Spectrometry: a tool to examine the degree of fractionation of pegmatites in the Prosperous Suite, Northwest Territories, Canada

EMILY M. PALMER¹, DAVID R. LENTZ¹, AND HENDRICK FALCK²

1. *Department of Earth Sciences, University of New Brunswick, Fredericton, New Brunswick E3B 5A3,*

Canada <epalmer@unb.ca> ¶ 2. Northwest Territories Geoscience Office, Yellowknife, Northwest Territories, Canada

Exotic minerals, such as beryl, spodumene, and schorl, have been identified in LCT pegmatites located in the granitic plutons of the Prosperous Suite and surrounding supracrustal rocks of the Slave Province within a 40 x 50 kilometre zone north and northeast of Great Slave Lake. The presence of these minerals is typical of rare-element pegmatites that represent extreme fractionation. A gamma-ray spectrometer (GRS) was used in this preliminary study to measure the pegmatites, granites, and supracrustal rocks for K, equivalent U (eU), and equivalent Th (eTh). Uranium and Th are typically incompatible in fractionating magmatic systems and are used to evaluate general fractionation, which will constrain the search for their rare-element potential. This data, coupled with field observations, is used to examine the degree of fractionation seen in the pegmatites locally and regionally.

Sampling of pegmatites around four of the 14 Prosperous Suite plutons (Prestige, Prosperous, Sparrow/Hidden) was completed this past summer. A total of 225 pegmatite and 71 granite surface GRS measurements were taken at this time, ranging up to 236 ppm eU and 56 ppm eTh for pegmatites and up to 35 ppm eU and 45 ppm eTh for granites. The measurements were made using a handheld RS-125 Spectrometer equipped with a 2 x 2 NaI crystal detector with an integration time of 120 seconds. The measurements were taken along transects across zones of unweathered pegmatites and of surrounding unweathered rock.

In general, the pegmatites intruding the supracrustal rocks are more fractionated than those intruding the plutons of the Prosperous Suite. The transects across the zones of the pegmatites show an increase of eU and eTh when moving from wall zone to intermediate zone, and a decrease in the eU/eTh in the core. The metasedimentary sequence surrounding the Prestige pluton has multiple pegmatites with large beryl crystals (up to 10 cm in diameter). These pegmatites have abnormally high eU/eTh ratios. The pegmatites hosted in the pluton have low eU and eTh contents. These observations lead to the interpretation that the pegmatites intruding the metasedimentary sequence are more fractionated than those intruding the Prestige pluton. Pegmatites surrounding the Prosperous pluton have a low average eU/eTh ratio, suggesting a lower degree of fractionation; however, an outlier zone was identified at the Riber pegmatite. The pegmatites intruding both the plutons and supracrustal rocks in the Sparrow/ Hidden area have the highest average eU and eU/eTh measurements, which coincides with an elevated content of beryl and spodumene in these pegmatites.