Lithium isotope and trace element whole rock signatures of Lithium-Cesium-Tantalum-type pegmatites

ELSPETH M. BARNES*, DOMINIQUE WEIS
AND LEE A. GROAT

Department of Earth and Ocean Sciences, University of British Columbia, 6339 Stores Road, Vancouver, B.C., V6T 1Z4 (*correspondence: ebarnes@eos.ubc.ca)

Lithium isotopes fractionate readily in low temperature fluids and it has been suggested by Teng *et al.* [1] that elevated δ^7Li values in pegmatites (which can crystallise at 400-600 ºC) reflect increased magmatic fractionation. Lithium isotopic analyses have been incorporated into a geochemical study of 23 sizeable (>1-~20 kg) whole rock samples in an investigation into the formation of the swarm of >200 pegmatites of the Lithium-Cesium-Tantalum-type (LCT-type) Late Cretaceous Little Nahanni Pegmatite Group (LNPG) in the Mackenzie Mountains, Northwest Territories.

The dykes are mainly composed of quartz ± feldspar ± mica ± spodumene. Geochemical analyses show typical LCT-type compositions with high lithium, cesium and tantalum (Li up to 14000 ppm; Cs 50-500 ppm, Ta 0-480 ppm). High-precision trace element compositions show that overall the dykes are strongly depleted in rare earth elements (REE) (0.5-3.6 ppm, average 1.9 ppm). However, variations in REE profiles separate the samples into three groups with relatively straight, shallow listric, or 'M-tetrad' (with strongly negative Eu anomalies) patterns.

Lithium isotope analysis by Nu MC ICPMS indicate that the 23 samples range from δ^7Li (–0.73 - 11.36). Samples with highly fractionated geochemical signatures (Nb/Ta (0.6-2.7), Ce/Pb (0.01-0.1) and Zr/Hf (6-10.5)) and high Rb values (up to 7500 ppm) are associated with elevated δ^7Li values (–0.75 to 11.36). Samples which are among the least fractionated (Nb/Ta (1.3-3.3), Ce/Pb (0.1-0.3)) which have relatively low total Rb abundance (1220-2300 ppm) and 'M-tetrad' REE patterns, all come from spodumene-bearing pegmatites and have among the lowest δ^7Li values (–0.73 - 0.6).

Initial interpretations of these results, which associate increased δ^7Li values with geochemical indicators of extreme magmatic fractionation, concur with other researchers. We are also investigating whether the combined REE tetrad patterns and low δ^7Li values have a magmatic or hydrothermal origin.

[1] Teng, F.-Z., McDonough, W. F., Rudnick, R. L., Walker, R. J. & Sirbescu, M.-L. C. (2006) *Am. Min.* **91,** 1488-1498.

Siderophile and chalcophile elements in sulphides from the Morokweng LL meteorite and implications for platinum-group element deposits

SARAH-JANE BARNES[1]*, RICHARD A. COX[1],
HAZEL M. PRICHARD[2], PETER C. FISHER[2],
IAIN MCDONALD[2], WOLFGANG. D. MAIER[3] AND
MARCO A.G. ANDREOLI[4]

[1]Sciences de la Terre, Université du Québec à Chicoutimi, Chicoutimi, Québec, Canada G7H 2B1 (*correspondence: sjbarnes@uqac.ca)
[2]Cardiff University
[3]University of Western Australia
[4]University of Witwatersrand

Our new results are from the Morokweng LL meteorite, which contains ~ 5 weight % Po and Pn and no native Fe. Most Ni, Co, Se, Ru, Rh, Pd, Ag, Re, Os and Ir were found to be present in Po and Pn. A moderate amount of the As, Bi and Te are present in Pn and Po (20-25%), but very little (<10%) of the Cd, Sb, Pt and Au are present in Po and Pn. The only PGM observed were Pt arsenides and Rh arsenides. In both cases these were present as very small inclusions within or at the edge of the Pn and Po. It is assumed that the Pt arsenide is the main host for Pt. Rhenium, Os, Ir, Ru and Rh are present in approximately chondritic proportions in both Po and Pn consequently CI-chondrite normalized metal patterns are approximately flat from Re to Rh. Palladium and Ag are concentrated in Pn while Pt and Au are excluded. The Pn metal patterns thus have large negative Pt and Au anomalies. All of Pd, Ag, Pt and Au appear to be excluded from Po, resulting in metal patterns with a negative slope from Rh to Ag. However, the presence of small Pn exsolutions in the Po leads to small positive Pd and Ag anomalies superimposed on this general trend. These results are similar to those obtained from Po and Pn from PGE deposits. However, in PGE deposits there are more PGM inclusions and a wider variety of PGM, consequently the weight fraction of PGE present in solid solution in Po and Pn is lower. This could be because in PGE deposits a combination of slow cooling and deuteric fluids encourages exsolution of the PGM from BMS or because some PGM crystallize from fractionated sulphide liquid.