

SCIENTIFIC COMMUNICATIONS

QUANTITATIVE MASS BALANCE OF PLATINUM GROUP ELEMENTS IN THE KELLY LAKE Ni-Cu-PGE DEPOSIT, COPPER CLIFF OFFSET, SUDBURY*

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Abstract

A mineralogical mass balance has been calculated for the fraction of platinum group elements (PGE) incorporated as solid solution in sulfides and sulfarsenides and the fraction that occurs as major constituents in platinum group minerals (PGM) in the Kelly Lake Ni-Cu-PGE sulfide deposit in the Copper Cliff offset, Sudbury. Low levels of PGE in sulfides were determined quantitatively for the first time in Sudbury ores by laser ablation microprobe-inductively coupled plasma-mass spectrometry (LAM-ICP-MS), providing significantly more accurate data on the inventory and mineralogical distribution of the PGE than in previous studies. The majority of the Pt (98%), Rh (97%), and Ir (86–91%), and lesser but still large fractions of Pd (77–87%) and Ru (67–71%), occur as discrete PGM with the remainder occurring (in decreasing abundance) in solid solution in gersdorffite (1,700 ppm Σ PGE), pentlandite (1.35 ppm), chalcopyrite (0.5 ppm), and pyrrhotite (0.3 ppm). Although the PGE are present in low concentrations in sulfides, the abundances of these phases can be high enough to constitute a significant fraction of the total PGE. In particular, significant proportions of the Pd (14–23%) and Ru (~30%) in the Kelly Lake samples are hosted by sulfides and sulfarsenides. This has important implications for the genesis of the PGE, for the redistribution of the PGE during cooling and hydrothermal alteration, and for metal recovery during ore beneficiation.

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*Supplemental digital files are available online at <http://www.segweb.org/EG/papers/Abs100-8_files/HuminickiAppendices.pdf>.