Preface for thematic issue on Ni–Cu–PGE deposits

C. M. Leshner · P. C. Lightfoot

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Most of the papers in this thematic issue are derived from a 1-day session on magmatic Ni–Cu–(PGE) deposits that was held at the 11th International Platinum Symposium in June 2010 in Sudbury. The meeting was dedicated to Professor Reid R. Keays, who continues his leadership in Ni–Cu–(PGE) research by contributing to two papers in this volume.

The authors cover a range of Ni–Cu and PGE sulfide deposit types, and explore the evidence for the mechanisms and timing of sulfide saturation in major systems like Norilsk, Voisey's Bay, Mt. Keith, and Stillwater, as well as smaller deposits and intrusions like Eagle, Kalatongke, Kangerlussuaq, Nkenja, and Wengeqi. The empirical observations reported in the papers are valuable indicators in mineral exploration, and underpin process models for ore formation. The authors combine a wide range of detailed sampling, petrology, and analytical methods to provide readers with a timely synthesis that advances research and understanding in the field of magmatic Ni–Cu–PGE sulfide deposits.

Holwell, Abraham-James, Keays, and Boyce report data for disseminated to blebby sulfides in a dyke in the Kangerlussuaq region of East Greenland. They show that the interaction with sulfides in the sediments induced high-level sulfide saturation, producing Cu- and Pd-rich sulfides, which were then entrained and emplaced along the dyke margins. They discuss the exploration implications of these data.

Lightfoot, Keays, Evans-Lamswood, and Wheeler present new data relevant to interpreting the S saturation history of mafic intrusions in the Nain Plutonic Suite, including the world-class Voisey's Bay Ni–Co–Cu–(PGE) deposit. Because all of the magmas in the area are systematically depleted in PGE relative to Cu–Ni–Cu, they conclude that this more likely reflects retention of PGEs in sulfides the source rather than the anomalously low R factors or prior sulfide segregation event that had been previously proposed. This has implications not only for the genesis of the ores but also for the utilization of PGE depletion signatures in exploration.

Li, Zhang, Fu, Qian, Hu, and Ripley describe the Kalatongke Ni–Cu deposit in the Central Asian Orogenic Belt and conclude that it formed from a magma generated in a slab window and that the depletion in PGE reflects an early stage of sulfide segregation.

Krivolutskaya, Sobolev, Snisar, Gongalskiy, Hauff, Kuzmin, Tuschentsova, Svirskaya, Rudakova, Kononkova, and Schlychkova report the first detailed geological description of the Maslovskoe Pt–Cu–Ni deposit, which is believed to be the southwestern extension of the Norilsk 1 intrusion. The paper reports detailed petrology, mineral chemistry, and geochemistry, and the data are used to argue that the formation of the deposit is unrelated to the metal-depleted basalts of the Siberian Trap.

Ding, Ripley, and Li report a detailed geochemical investigation of the Eagle deposit in Michigan. They report that at least four pulses of compositionally different sulfide magma were transported from depth by multiple pulses of magma passing through the Eagle conduit system. The sulfide liquids were deposited in the wider part of the conduit system at Eagle due to decreasing velocity. Sulfide saturation was attained in the parental magma due in large part to the assimilation of country rock sulfur at depth.

Editorial handling: P. Williams

C. M. Leshner (✉) · P. C. Lightfoot
Laurentian University,
Sudbury, Canada
e-mail: mlesher@laurentian.ca

Houle, Leshar, and Davis describe a spectacular example of thermomechanical erosion of andesite by komatiite magma at the archetypical Alexo Ni–Cu–(PGE) deposit in the Abitibi Greenstone Belt of Ontario.

Barnes, Fiorentini, and Fardon report the results of a detailed study of the PGE concentrations in the Mt. Keith Ni–(Cu)–(PGE) deposit in Western Australia, attributing the systematic and consistent nature of Pt depletion as a primary magmatic process and not an artefact of alteration, as has been interpreted for most deposits.

Keays, Lightfoot, and Hamlyn report the results of a detailed PGE study of the Stillwater Complex, suggesting that the anomalous PGE contents of the J-M reef do not result from magma mixing or fluxing by volatile-rich fluids, as previously proposed, but that they formed from a parental magma that was strongly enriched in PGE,

possibly by a process involving a prior stage of sulfide segregation and redissolution.

Evans, Barrett, Prichard, and Fisher describe Pt–Pd–Au mineralization in the Nkenja mafic–ultramafic body in the Ubendian metamorphic belt of Tanzania, interpreting it to have formed by magmatic processes with metamorphic and/or hydrothermal overprint in the crustal section of a dismembered ophiolite complex.

Su and Leshar describe the Pt–Pd mineralization at the Wengeqi deposit in Inner Mongolia and attribute it to upgrading of low-grade magmatic Ni–Cu–(PGE) mineralization by a high-temperature magmatic-hydrothermal fluid.

We are very grateful to the authors for their work in preparing and promptly revising the papers, and to all of the external reviewers for their mostly rapid but uniformly insightful reviews of the papers.