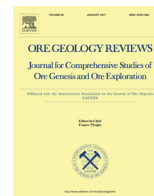


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Book review

Nickel Sulfide Ores and Impact Melts: Origin of the Sudbury Igneous Complex, Peter C. Lightfoot. Elsevier (2016). (ISBN 978-0-12-804050-8) USS 102/EUR 73

This book constitutes an invaluable resource for anyone exploring for or doing research on magmatic Ni-Cu-(PGE) sulphide ores. The book is very well written, providing a comprehensive account of the geology one of the world's great mining camps. The many illustrations are excellent and much of the critical information is summarized in tables, making the book highly useable. Although the main focus of the book is the Sudbury Ni-Cu-PGE sulphide ores and their genesis, there is much in it that is applicable to all magmatic Ni-Cu-(PGE) sulphide deposits such as a useful synthesis of the processes involved in their formation.

Chapter 1 is an overview chapter that puts the Sudbury Ni-Cu-PGE sulphide deposits into context as one of the world's premier mining camps. It provides a review of the many debates on the origin of the Sudbury Igneous Complex (SIC) and its ore deposits as well as a summary of the evidence that the SIC and its ore deposits are the products of meteorite impact. A most useful table is one which summarizes the nomenclature and terminology used to describe the Sudbury rocks.

Chapter 2, which is a synthesis of the geology of the Sudbury Structure, provides a comprehensive review of the target rocks that were impacted by the meteorite responsible for the formation of the SIC and its ore deposits. Detailed accounts are provided for the early Proterozoic East Bull Lake Type intrusions and the mid Proterozoic Nipissing Diabase. Both of these are members of two different Large Igneous Provinces (LIPs) and both host sub-economic PGE-rich Cu sulphides; their cousins in the area impacted by the meteorite may have been important sources of the metals for the Sudbury ores. Also covered in this chapter is the geology of the SIC and its footwall rocks, the "Offset" dykes, and the structure and the geochronology of the Sudbury rocks. The chapter finishes with a discussion of the events that affected the Sudbury Structure from the time of meteorite impact to final deformation of the Sudbury rocks.

Chapter 3 provides details of the petrology and geochemistry of the rocks. The questions addressed in this chapter include whether

or not the SIC was formed by a single magma, if the melt sheet produced by decompression melting following meteorite impact was well mixed or evolved differently in different segments, what was the source of the ore metals and S, and what was the timing of sulphide formation. The data acquired through numerous geochemical transects across the SIC are used to answer these questions.

Chapter 4 provides detailed descriptions of the Sudbury ore deposits in terms of mineral system concepts thereby providing the basis for the development of ore genesis models. Details are provided on the petrology, mineralogy and geochemistry of the ore systems accompanied by numerous excellent photomicrographs of ore textures. A paragenetic sequence of the main ore minerals is developed. The chapter is rounded off with a discussion of the formation of the mineral systems and the effects of later deformation on them.

Chapter 5 commences with a comparison of the Sudbury Structure with other terrestrial and solar impact craters. It also discusses regional controls, such as the thickness of the impact melt sheet and its evolution, on ore deposit endowment. The differentiation of the sulphide melts are discussed in detail as is the application of sulphide melt differentiation in exploration.

Chapter 6 places Sudbury in a global context. It provides a succinct account of the approaches that mining companies use in exploration as well as a synthesis of the features of ore deposits that are useful in exploration. It also contains very useful summaries of four of the world's major Ni deposits, these being Noril'sk (Russia), Jinchuan (China), Thompson and Voisey's Bay (both in Canada). This chapter finishes with a discussion of the future of Sudbury by putting it into the context of the global Ni supply chain and the impact of Ni laterite on that supply chain.

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