Ore Geology Reviews 90 (2017) 63–64

Contents lists available at ScienceDirect

Ore Geology Reviews

journal homepage: www.elsevier.com/locate/oregeo

Preface

Chromite: Petrogenetic indicator to ore deposits

Chromite [(Mg, Fe)O (Cr, Al, Fe^{3+})$_2O_3$] is the only primary source of Cr from natural rocks. Primary or liquidus composition of chromite can be used as a petrogenetic indicator because the chemistry of chromite reflects that of its parental magma, which generates in a specific tectonic setting. Chromite deposits are genetically linked to ultramafic-mafic magmatism that are restricted to specific periods in the geological time-scale, and have specific tectonic settings (e.g., Stowe, 1994; Mondal et al., 2006). For example: (1) stratiform and discordant chromitites within sill-like ultramafic bodies in greenstone belts are genetically linked to widespread high-Mg komatiitic magmatism that represents major crust building processes of the Earth throughout the Archean; (2) stratiform chromitites of mafic-layered intrusions in continental rift settings represent widespread boninite-norite magmatism during the Neoarchean-Paleoproterozoic after the formation of a supercontinent, and reflect a period of global-scale mantle upwelling or enhanced plume activities, and (3) stratiform and discordant chromitites of ophiolites are genetically linked to boninites of the convergent margin settings representing ore genesis in Phanerozoic. Since the chemistry of chromite from different tectonic settings strongly depends on parental magma compositions, the process of magma generation in the mantle is therefore vital for the formation of these different types of chromite deposits over the geological time-scale.

This special issue has organized 15 significant articles keeping the above-mentioned background, to document the updated knowledge on the various types of chromitite ore deposits that occur at different time periods over Earth's geological history. A group of paper addresses formation of stratiform chromitites hosted in mafic-layered intrusions. Pebane and Latypov investigate the significance of magmatic erosion for producing bifurcations in UG-1 chromitite layers in the Bushveld Complex, South Africa. In this paper they revisit the igneous layering within predominantly anorthositic cumulates underlying the UG-1 chromitite layer in the Bushveld Complex, and demonstrate that field relationships provide convincing evidence for the crucial role of 'magmatic erosion' in forming the bifurcations. Based on extensive field geological studies Mukherjee et al. present a new model on the origin of some UG-1 chromitite layers in the Bushveld Complex, South Africa. According to these researchers the studied field features provide excellent evidence that the UG-1 chromitite formed from chromite-saturated melts that were locally emplaced as sills into the footwall anorthosite. Ferreira Filho et al. discuss compositional modification of chromite in chromitites from the Luanga Complex, Carajás, Brazil, and consider both late-magmatic and metamorphic processes responsible for the alteration of chromite. Their results indicate that the common use of chromite composition as a petrogenetic indicator for mafic intrusions should be considered with caution. Marques et al. provide new geological information and new results of chromite compositions from the thick chromitites of the Jacuri Complex, NE Craton São Francisco, Brazil. They integrate previous information with the new data and discuss magma chamber processes that could explain the formation of the thick chromitites. Talukdar et al. trace the compositional evolution of the rare Fe-Al rich chromitite bands that are enclosed within the highly calcic anorthosite of the late Archean Sittampundi Layered Magmatic Complex, Tamil Nadu, India. These authors document that intense deformation and infiltration-driven metamorphism caused the magmatic chromite to become progressively more aluminous and magnesian.

The other group of paper addresses various aspects of chromitites from orogenic belts. Avcı et al. investigate the major and trace element compositions of Cr-spinel as well as the composition of platinum-group minerals (PGM), base metal sulfides (BMS) and silicate inclusions in Cr-spinel of chromitites from the Kızılyüksek region of the Pozantı-Karsantı ophiolite (Adana, southern Turkey), to understand the implication for crystallization from a fractionated boninitic melt. Bai et al. present the compositions of olivine and chromite from the Xiadong Alaskan-type complex in the southern part of the Central Asian Orogenic Belt, and summarize the global data from complexes worldwide to compare and investigate the compositional variations of olivine and chromite during fractional crystallization in different Alaskan-type complexes, and understand the potential controlling factors. González-Jiménez et al. investigate on zircon recycling and crystallization during formation of chromite- and Ni-arsenide ores in the subcontinental lithospheric mantle (Serranía de Ronda, Spain). These authors evaluate how crustal fluids/melts may form or incorporate zircons in the SCLM, as well as the impact that these processes have in the formation of chromitites in the upper mantle. Malitch et al. study laurite and zircon from the Finero chromitites (Italy) and present new insights regarding evolution of the subcontinental mantle. They integrate Re-Os LA-MC-ICPMS analyses of laurite to date melt extraction and possible metasomatic events in the Finero lithospheric mantle, with U-Pb, Lu-Hf isotopic study and trace-element analyses of zircon (using LA-ICPMS) to constrain the age, nature and evolution of this fragment of the subcontinental mantle. Tzamos et al. re-examine chromitite bodies from the South Vourinos ophiolite complex (NW Greece) and provide new geological, mineral-chemical and geochemical data, as well as compare the results with those from previous studies on these deposits to understand the genesis of the ore-body. Habtoor et al. document chemical

http://dx.doi.org/10.1016/j.oregeorev.2017.07.005
0169-1368/© 2017 Elsevier B.V. All rights reserved.

homogeneity of high-Cr chromitites as an indicator for widespread invasion of boninitic melt in mantle peridotite of Bir Tuluha ophiolite, Northern Arabian Shield, Saudi Arabia. This study represents the first detailed geochemical and mineralogical investigation of Bir Tuluha ophiolitic upper mantle rocks, including podiform chromitites and their host ultramafic rocks. Maibam et al. characterize chromite and chromite-hosted inclusions of silicates, sulfides, PGM and metal alloys in chromitites from the Indo-Myanmar ophiolite belt of Northeastern India.

Colas et al. evaluate the role of silica in the hydrous metamorphism of chromite and apply a new thermodynamic approach to explain the absence of brucite in metamorphosed chromitites. Their results help to decode the processes of metamorphism of ophiolitic chromitites unraveling the true nature of the fluids involved in such processes. Kapsiotis et al. discuss genesis of Cr-bearing hydrogrossular-rich veins in a chromitite boulder from Ayios Stefanos, West Othris, in Greece. In this article, the authors document geological, compositional and Raman spectroscopy data of the microveins. Evans uses chromite compositions in nickel sulfide mineralized intrusions of the Kabanga-Musongati-Kapalagulu Alignment, East Africa to understand the petrological and exploration significance.

Finally, as Guest Editors, we would like to thank all the authors for their efforts and patience regarding this edited special issue of the Ore Geology Reviews. We wish to acknowledge Franco Pirajno, the Editor-in-Chief of Ore Geology Reviews for his continuous support, encouragement and guidance all throughout the process of developing this special issue. The support staffs from Elsevier are thankfully acknowledged for their help in publishing this special issue. We are grateful to the experts and all the anonymous reviewers for their official review on various articles for this special issue: Ed Mathez, Tony Morse, Bruce Watson, Fernando Gervilla, Chusi Li, T. Morishita, Martin Whitehouse, Brian O'Driscoll, Wolf-Gang Maier, Iain McDonald, H. Rollinson, Davide Lenaz, Shoji Arai, Thomas Aiglsperger, Kurtuluş Günay, Ibrahim Uysal, Yan Wang, G. Garuti, P. Voudouris, Hassan Helmy, César F. Ferreira Filho, Ahmed Hassan Ahmed, K. Sajeev, Joyashish Thakurta.

References

Mondal, S., Ripley, E., Li, C., Frei, R., 2006. The genesis of Archaean chromitites from the Nuasahi and Sukinda massifs in the Singhbhum Craton, India. Precambr. Res. 148, 45–66.

Stowe, C.W., 1994. Compositions and tectonic settings of chromite deposits though time. Econ. Geol. 89, 528–546.

Sisir K. Mondal [a,*]
Ria Mukherjee [b]
[a] *Department of Geological Sciences, Jadavpur University, Kolkata 700032, India*
[b] *School of Geosciences, University of the Witwatersrand, Johannesburg 2001, South Africa*
* Corresponding author.
E-mail addresses: sisir.mondal@gmail.com (S.K. Mondal), ria.mkrj@gmail.com (R. Mukherjee)

Received 5 July 2017
Accepted 6 July 2017

Available online 12 July 2017