A LA-ICP-MS study of the massive sulfides from the Noril'sk-Talnakh mining district: Implications for the behaviour of Te, As, Bi, Sb and Sn during evolution of the sulfide liquid

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Platinum-group elements (PGE) can occur within base-metal sulfides (BMS), or as platinum-group minerals (PGM) [1]. Typically, PGM consist of PGE and one or more of the elements; Te, As, Bi, Sb or Sn (TABS). Despite the common presence of TABS in PGM, little is known about the potential role of TABS in collecting PGE. In order to assess their role, we have carried out a LA-ICP-MS study of the distribution of TABS in BMS from Noril'sk-Talnakh ores [2]. These BMS were chosen because they record the crystallization history of sulfide liquid from Cu-poor ores which represent the first sulfides to crystallize to Cu-rich ores which represent the last sulfides to crystallize. The BMS from Cu-poor ores contain have low concentrations of TABS, whereas BMS from Cu-rich ores are richer in TABS, reflecting the increase of the TABS in the fractionated liquid. Mass balance calculations show that most of the Te, Bi and Sn are within the BMS in the Cu-poor ore whereas only 50% of these elements are found in BMS in the Cu-rich ore. In both ore types, PGM account for the balance of Pd, Pt and TABS. We propose that the Cu-poor ore consists of early formed adcumulate with BMS which have TABS concentrations sufficiently low to be accommodated in the BMS and a small primitive liquid component that is was not yet enriched in TABS. Whereas the Cu-rich ore contains more liquid component and this fractionated liquid was rich in TABS. PGM crystallize from this fractionated TABS-rich liquid.

[1] Barnes and Ripley (2016) Reviews in Mineralogy and Geochemistry 81, 725-774. [2] Duran et al. (2017) Ore Geology Reviews 90, 326-351.