Chemical and textural variations across the UG2 chromitite at the Khuseleka mine, Bushveld Complex

ALENA SEDUNOVA[1], ILYA VEKSLER[12], VLADIMIR ZHDANOV[1], KONSTANTIN KAZYMOV[1] AND DAVID REID[3]

[1]Perm State University, Russia, sedunova.alena.89@ya.ru
[2]Technical University Berlin, Germany, veksler@gfz-potsdam.de
[3]University of Cape Town, Rondebosch, South Africa, david.reid@uct.ac.za

Here we present results of a detailed petrographic and mineralogical study of rock textures and mineral chemistry in a vertical profile across the platiniferous UG2 chromitite layer at the Khuseleka mine in the south-western part of the Bushveld Complex, South Africa. The study has been carried out on a drill core section, 1.7 m in length, comprising the lower part of the hanging wall medium-grained feldspathic pyroxenite with a thin (9 cm) leader chromitite seam, the main chromitite seam 70 cm thick and the upper part of the footwall pegmatoidal, plagioclase-bearing pyroxenite. The whole length of the drill core was scanned by X-Ray computer tomograph (XRCT), cut lengthwise into a set of 35 petrographic thin sections, which were used for electron microprobe analyses of the main rock-forming minerals orthopyroxene, plagioclase and Cr-spinel. Crystal size distribution (CSD) diagrams were constructed for chromite on the basis of statistical analysis of the 2D (thin sections) and 3D (XRCT) images. The XRCT data was also used for calculation of mineral modes at the scale of a single thin section.

According to our electron microprobe results, Mg# of orthopyroxene from footwall and hanging wall pyroxenites are about the same (83-84 and 81-83 respectively) and lower than the Mg# of poikilitic orthpyroxene cementing chromite crystals in chromitite seams (89-91). The composition of plagioclase in silicate cumulates and chromitite varies broadly from An_{30} to An_{85}. Poikilitic plagioclase cementing chromitite tends to be depleted in potassium (0.03-0.2 wt.% K_2O) in comparison with plagioclase from pyroxenite (0.15-0.35 wt.% K_2O). Compositions of disseminated chromite crystals from footwall and hanging wall pyroxenites vary broadly (Mg# 19-41; Cr# 45-71). Spinel compositions within chromitite seams are much less variable (Mg# 49-53; Cr# 63-65).

The collected data will hopefully through new light on the roles of cumulus and post-cumulus processes in shaping the UG2 chromitite layer and its mineralisation. The project has been sponsored by RSF grant No. 14-17-00200.