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Characterisation of new potential reference materials for microanalysis: chromite and orthopyroxene

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Quantitative in-situ methods use reference materials for calibration and verification of quality control. Natural minerals are widely used as matrix-matched reference materials for EPMA and LA-ICP-MS (e.g., 1, 2, 3, 4, etc.). The main criteria for developing new natural mineral standards are: chemical homogeneity with respect to the element(s) or isotopic ratio(s) of interest; sufficient quantity of material; and a sufficiently large fragment size, ideally greater than 1-2 mm. This study reports testing of chromite (Crt), orthopyroxene (OPX) as prospective natural reference materials for major, minor, and trace elements.

The RI 3/1 specimen is a massive Crt from the Rai-Iz ore deposit in the Polar Urals. The OPX was obtained from mantle lherzolite xenolith sh11-2, which was the source also for the reference olivine MongOl sh11-2 (3).

Chromite and OPX samples were analysed with the field emission electron microprobe JEOL JXA iHP200F and a LA-ICP-MS system, which comprises a Resolution SE 193 nm excimer laser coupled with an Agilent 8900 triple quadrupole mass spectrometer.

Chemical homogeneity is considered as the variation in element mass fraction that does not exceed the measurement uncertainty of an analytical method (5) and was assessed by ISOPLOT weighted mean calculation method (http://isoplotr.es.ucl.ac.uk/) for individual analyses of elements and their total analytical uncertainty.

We show that Crt is homogenous for Cr, Al, Mg, Fe, Sc, Ti, V, Mn, Ni, Co, Zn, Zr, and Ga. The OPX is homogenous for all major and the majority of measured trace elements.

The analytical data from EPMA and LA-ICP-MS match each other for the majority of major and minor elements. Further investigation of these minerals will consist of round-robin evaluation of Crt and OPX in different laboratories and Mössbauer spectroscopy for Fe^{3+}/Fe^{2+} of Crt.

1. Jarosewich et al 1980 Geostand. Newslett. 4 43-47; 2. Audetat A et al 2014 Geost. Geoanalyt Res 39 171-184 ; 3. Batanova V G et al 2019 Geost. Geoanalyt Res 43 453-473 ; 4. Allaz J M et al 2023 Geost. Geoanalyt Res 47 907-929 ; 5. Boyd F R et al 1967 Carnegie Inst. Washington Yearbook 67 21–215