Identification and quantification of PGMs by combining MLA and EPMA with a new approach to the offline overlap correction of major and trace PGE concentrations

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The identification and accurate characterisation of platinum-group minerals (PGMs) is usually a very cumbersome procedure due to their small grain size (typically below 10 μm) and inconspicuous appearance under reflected light. A novel strategy for finding and quantifying PGMs by combining mineral liberation analysis (MLA), a point logging system and electron probe microanalysis (EPMA) was thus developed.

As a first step, the PGMs are identified using the MLA. Grains identified as PGMs are then marked and coordinates recorded with the point logger are then transferred to the EPMA. Case studies e.g. from the platiniferous reefs (Merensky Reef and UG2) of the Bushveld Complex (South Africa) illustrate that the combination of MLA, point logger and EPMA results in the identification of a significantly (up to 20 times) higher number of PGM grains than by careful reflected light microscopy.

The analysis of PGEs as major elements in PGMs or as trace elements in e.g. base metal sulfides by EPMA requires considerable effort. Due to the often significant overlaps between the X-ray spectra of almost all platinum-group and associated elements, X-ray lines suitable for quantitative analysis need to be carefully selected. As peak overlaps cannot be avoided completely, an offline overlap correction based on weight proportions has been developed. A reliable overlap correction is of particular importance e.g. in Ru-sulfides as laurite if the overlapped element is a trace element (Rh) and the overlapping element is a major constituent (Ru). Results obtained with the procedure attain acceptable totals and atomic proportions, indicating that the applied corrections are appropriate.