

https://dspace.org/

Investigating non-disclosing precious metal components in the UG2 reef

McDowell, Anna Cecilia Magdalene

2011-03-17
http://hdl.handle.net/10539/9161

Downloaded from a DSpace repository. https://dspace.org/

CHAPTER 2: AIMS AND OBJECTIVES OF THE STUDY

2.1 INTRODUCTION

Although reliable, the analysis of Merensky and UG2 ore by Pb-FA and NiS-FA techniques is expensive, time consuming and extremely labour intensive. A project was launched to develop an alternate analytical method for this application, which would be less expensive and which would reduce labour and minimize analytical turnaround time, all of which are fundamental requirements of the platinum mining operations environment, whilst at the very least maintaining reporting accuracy.

This alternate method involved fusing the samples with a strong basic flux followed by leaching and ion-exchange for removal of the base metal matrix. The flux used in the initial testwork, resulted in the complete dissolution of the siliceous component of the Merensky and UG2 Reefs, excepting what appeared to be dark green crystals when viewed under a light microscope. The discovery of the residual chromitite crystals (RCCs) resulted in the following questions were raised:

- Would these chromite crystals contain PGEs? (Pt, Pd, Rh, Ru, Os, Ir and Au)
- Would existing chemical dissolution processes such as NiS-FA etc. dissolve the crystals or, are head grades as currently reported, understated?
- If the crystals do contain PGEs and provided that such PGEs may be liberated, what impact would such PGEs (if previously not reported) have on the platinum market?

This research work will aim to answer the above questions and with reference to a series of literature reviews regarding platinum group metal mineralisation within chromitite crystals [35-38] the following hypothesis were raised:

- The UG2 reef contains non-disclosing precious metal bearing components, whereby the precious metal content is captured in solid solution and as such is difficult to quantify even by optical microscopy.

- If the crystals do contain PGEs, does a commercial method exist or could a method be developed to liberate the PGEs contained therein.

2.2 Aims and objectives of the study

With this in mind, the experimental design was established with the following distinct objectives:

- To prepare a composite material which would be representative of the UG2 tailings material and to analyse such material for base and precious metals:

  It was recognised that the tailings material would best matrix match that of the RCCs, (excepting silica) being a primary source of such crystals. As a direct result if PGEs were not detected in the tailings material it would be unlikely that they would be detected in the RCCs and further, success in accurately determining PGEs at trace levels in the tailings stream (for which comparative industry results could be sourced) would provide additional confidence in an ability to determine PGEs in the RCCs.

- To extract the RCCs from the UG2 tailings material:

  It would be critical to optimise an extraction process to maximise the recovery of the chromitite crystals which had largely been discovered by chance while investigating an alternate process for evaluating UG2 ores.

- To develop a method for the dissolution of the RCCs:

  Clearly in order to fully evaluate the RCCs would require a process which would result in complete digestion of the crystals prior to analysis.

- To determine the base and precious metal composition of the RCCs:

At the outset it was unclear as to what concentration of PGEs, if present at all, would exist within the chromitite crystals. However, assuming that the concentrations would be at trace levels, it was decided that the primary technique for PGE evaluation would be pre-concentration using Te co-precipitation followed by analysis using ICP-MS.

- Mineralogy studies:

  Upon the assumption that PGEs would be detected within the RCCs it was decided to try to confirm whether such PGEs might be present as inclusions or in solid solution through mineralogy studies.

Despite previous studies of UG2 Reef derivatives for precious metal content this study is unique in that, a UG2 Tailings stream, which is the "waste" stream from UG2 Mine Concentrator operations, was selected as the material from which to extract residual chromitite crystals for analysis and that the focus of the investigation would be non-liberated PGEs potentially contained within the chromitite crystals.