

How the SEM-EDS Can Help the Refinery

Amanda Hefer

Rand Refinery (Pty) Ltd

(+2711 418 9121, amandah@gold.co.za)

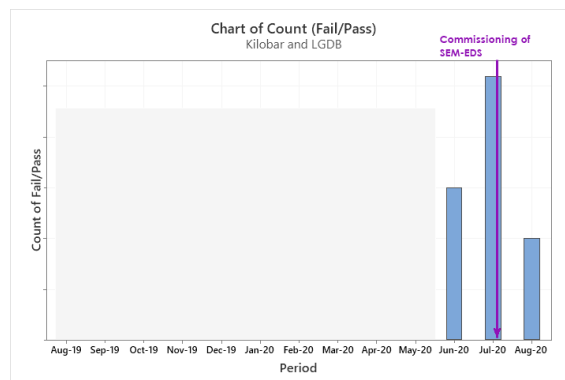
Recently a Scanning Electron Microscope, equipped with an EDS (Energy Dispersive X-ray Spectrometer), was purchased to enable more accurate analysis during investigations to establish the reasons in gold granule batch failures. In the past, it was a daunting task to correctly analyze inclusions due to the size of the product and some instrument limitations. The available techniques with the limitations and risks are summarized in Table 1 below:

Table 1: Available Analyzing Techniques

INSTRUMENT	LIMITATIONS	RISK
MICROSCOPE	<ul style="list-style-type: none">• Visible technique• Size of sample• Level of magnification	<ul style="list-style-type: none">• Damage to equipment• Incorrect analysis
SPARK-OES	<ul style="list-style-type: none">• Analysis detection area of 3.5mm• Size of sample• Type of sample	<ul style="list-style-type: none">• Damage to equipment
SEM-EDS ANALYSIS (OFFSITE)	<ul style="list-style-type: none">• Size of sample• Turnaround time	<ul style="list-style-type: none">• Security Risk

The SEM-EDS was successfully commissioned on 27 July 2020, just in time to investigate the root cause of the recent gold granule batch failure. Several contaminated kilobars were analyzed and the suspected contaminant was successfully detected. However, nine other elements were also detected at concentrations greater than 1%. An example of such an inclusion is depicted in Figure 1. Due to the extra detected elements, different samples feeding the process had to be analyzed. In the end, not only the source, but also other process improvement opportunities could be identified.

By using the SEM-EDS's analyzing and imaging capabilities, the operational team at Rand Refinery (Pty) Ltd. could make process and equipment changes. This resulted in cost savings of R600,000 and increased customer satisfaction by meeting order deadlines.



Graph 1: Graph depicting the Pass / Fail rate of gold granule batches for FY20.

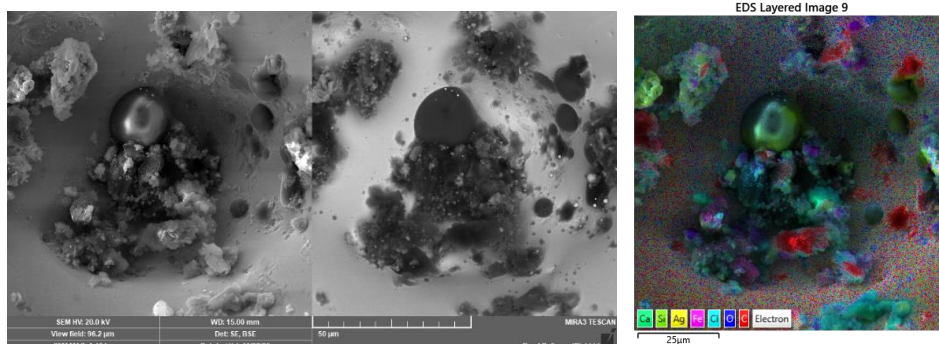


Figure 1: Recent SE and BSE image with elemental maps from an inclusion on a 9950 Kilobar