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(Article begins on next page)

QEMSCAN® ANALYSIS FOR THE EXPLORATION OF NONSULFIDE ZN DEPOSITS: THE JABALI CASE (YEMEN)

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The Jabali deposit lies about 110 km east of Sana'a, the capital of Yemen, in the Marib-Al-Jawf/Sab'atayn basin. Ore resources have been estimated at 12.6 Mt with 8.9% zinc, 1.2% lead and 68 g/t silver. The orebody, hosted in Jurassic carbonate rocks, consists of a secondary Zn-Pb mineralization formed from the oxidation of a primary sulfide deposit. The primary deposit shows the general features of MVT ores, with remnant sphalerite, galena and pyrite/marcasite.

The main nonsulfide Zn mineral is smithsonite, which replaces dolomite and partly sphalerite. Hydrozincite and hemimorphite occur in traces. A previous mineralogical study, carried out by OM, XRD, and SEM-EDS, has shown that a discrete amount of Zn is also hosted in several dolomite phases. Zinc in dolomite can be misleading for ore estimation: using the classic analytical methods, a quantitative evaluation of Zn-dolomite was not possible. In this study the problem was investigated using QEMSCAN®.

Quantitative QEMSCAN® analysis was performed on a selected number of Jabali core samples, as well as on mineral concentrates. Each sample (1m long core section) was crushed and sieved (<1 mm size) and a representative quantity of material (1-2gr) was analyzed. QEMSCAN® allowed a rapid quantification of the mineralogy, resulting in the modal abundances of the mineral phases identified by chemistry. An assessment of the individual textural features, mirrored by detailed images of the spatial distribution of economic and non-economic minerals and their intergrowths was also produced.

Using QEMSCAN® the smithsonite content in the cores was found ranging from 5 wt % to 80 wt %, (61 wt % to 85 wt % in the concentrates), and we could also distinguish between 33 wt % (on average) of pure smithsonite and 4 wt % (on average) of Mg-containing smithsonite. Three main types of Zn-bearing dolomite phases were identified: Zn-dolomite (up to 39 wt%), Zn-Mn-dolomite, and Zn-ankerite (both below 5 wt% Zn).

This study shows that QEMSCAN® can be essential for nonsulfide ore characterization: it allows a correct quantitative evaluation of the isomorphic phases that typically characterize many secondary minerals occurring in this type of deposits. The only constrain is a careful validation of the SIP (species identification protocol) file, by preliminary use of XRD and SEM-EDS.