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Gold mineralization in the Karagwe-Ankole belt: Auriferous quartz veins from the Byumba deposit (Rwanda)

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Summary. — The Central African Karagwe-Ankole belt (KAB) hosts many important mineral resources, including the metals Ta, Nb, Sn, W, Li and Au, which have been the subject of several geological studies in the last few years (FERNANDEZ-ALONSO et al. 2012). Despite this effort, many unanswered questions remain regarding the formation conditions and mineralization style of the gold deposits. The aim of this study is to determine the controlling factors on the gold distribution and the feasibility for further exploration and possible extraction of gold ore within the Byumba deposit in northern Rwanda.

Explorative drillings (8 drill cores, ±1800 m in total) from the Byumba deposit were logged and sampled for further petrographic investigation and Micro X-ray fluorescence (µXRF) based major and trace element mapping (a rapid, high-resolution and non-destructive geochemical screening tool). The rocks from the Byumba deposit show distinct phases of folding and shear deformation. Three main quartz vein phases were identified (pre-, syn-, post-folding) (Wouters et al. 2020). A generation of post-folding (V3) massive or sigmoidal quartz veins, crosscut the folds and cleavage. Geochemical characterization by µXRF element mapping identifies the shear-related chlorite-rich quartz veins (V3), as host of the primary gold mineralization (Wouters et al. 2020). Within these veins, a dark grey quartz phase, hosts the gold mineralization that occurs in the form of sub-micron gold patches and of small disseminated blebs. In addition, µXRF mapping shows a correlation between the gold-enriched quartz veins and the arsenic content of the analyzed mapping areas, expressed by the presence of arsenopyrite (FeAsS) and As-rich pyrite (FeS2), but no detectable amount of gold is present within the sulfides themselves (Wouters et al. 2020). A supergene enrichment phase of gold is identified at reduction zone boundaries through logging of the gold grade.

The occurrence of sub-micron free gold within the quartz phase poses problems for processing of the ore, as concentration of gold through gravity-based techniques is not feasible. Hence, heavy processing and environmental unfriendly leaching techniques would have to be applied. Furthermore, the absence of significant amounts of refractory gold within sulfides inhibits the use of roasting and other techniques frequently used in gold extraction that rely on a significant presence of gold within sulfides (Marsden & House 2006).

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