Morphology and mineral chemistry of gold-bearing pyrites in the Runruno ore deposit, Nueva Vizcaya, Philippines

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The Runruno ore deposit is one of the few known yet less studied ore deposits in the Philippines hosted by alkaline rocks. It is located within a large alkaline volcanic complex with a defined resource of 1.73 million ounces of gold and 45.58 million pounds of molybdenum as estimated by Metals Exploration (2014). The style of mineralization in the area is mainly hydrothermal, with mineralized rocks mostly containing pyritic assemblages or their oxidized equivalent. Evidences from a previous study by Jensen (2008) show that significant gold mineralization associated with strong K-silicate + pyrite alteration. In this study, we investigated the use of pyrite mineral chemistry and crystal morphology as potential indicator of the style of gold mineralization in the Runruno ore deposit. Using the assay data, representative samples with pyrite content were collected from depths with low, intermediate and high-gold content. Secondary electron and back-scattered electron (BSE) imaging in the Runruno samples showed the differences in morphology and textures in pyrites in relation to gold content. Pyrites associated with low gold occur as disseminated fine-grained anhedral crystals and aggregates of anhedral pyrites. Those with intermediate gold content is related to anhedral to subhedral individual crystals of pyrites, while high gold pyrites has coarser subhedral to euhedral individual crystals with distinct oscillatory zoning. Electron Probe Microanalysis (EPMA) results show a negative correlation of As with S in pyrite. This is consistent with the substitution of As for S in the pyrite structure as previously studied by various authors. (Fleet and Mumin, 1997 and Reich et al., 2005) A clear positive linear correlation between gold and arsenic grade is also present in the samples as reported by FCF in a study in 2015. Morphological, textural and chemical studies of pyrite reveal that the fine-grained, disseminated or aggregates of pyrite are “barren” while euhedral to anhedral coarse-grained pyrites contain Au and various trace elements. Gold, more specifically, is present in arsenian pyrite as structurally-bound Au^{1+} or Au-bearing nanoparticles.