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Characteristics of the Ore-Forming Fluids of the Giant Karagba-Chauffeur-Durba (KCD) Gold Deposit, Northeastern Democratic Republic of the Congo (DRC)

Rowin P. Marais, Bjorn P. von der Heyden
Stellenbosch University, Stellenbosch, South Africa

The giant KCD gold deposit with more than ten Moz Au, is situated in the Neoarchean Moto Greenstone Belt within the Kibali gold district, DRC. Situated on the Congo Craton, this district is one of the largest gold-producing regions in Africa. Characterized as an orogenic-type gold deposit, the mineralization in this district is a result of complex deformation events, which included thrust faulting, shearing, and folding. Gold mineralisation preferentially localises on reactive banded iron formation (BIF) units, and although the trapping mechanism is thus predictable, the characteristics of the ore fluid have not been fully constrained.

The study objective is to provide detailed characterisation of the ore fluid physicochemistry inferred from petrographic and chemical evaluations of the wall-rock alteration, and from direct observations of fluid inclusions (microthermometry and Raman spectroscopy). The results from twelve samples collected from four mineralized lodes represented by highly-altered quartz-carbonate-pyrite damage zones, were investigated using 22 fluid inclusion sections, eighteen thin sections and 52 polish mounts. Fluid inclusion results indicate a $\text{H}_2\text{O}-\text{NaCl}-\text{CO}_2-\text{CH}_4-\text{N}_2$ fluid with emplacement temperatures ranging from 156°C - 375°C (avg. 265°C). Petrographic analyses show that the siderite- and pyrite-rich alteration signatures are dominated by carbonic and sulphuric reactions with the iron-rich minerals present in the host lithologies. These reactions suggest the presence of an aqueo-carbonic, sulphur-rich fluid responsible for the transport and ultimate precipitation of gold. These detailed insights into the fluid physicochemistry, coupled with an evolving knowledge of the local structural geology, provide a firmer basis for predicting the localised conditions under which ore shoots are likely to form, thus contributing towards improved exploration paradigms for the area.