Alteration Zonation Patterns Characterized by Hyperspectral Data within Orogenic Gold Deposits of the Ahafo South Camp, Sefwi Granite-Greenstone Belt, Ghana

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The application of hyperspectral analysis provides the ability to address inconsistent recognition of alteration minerals captured by traditional logging methods. Routine hyperspectral analysis of drill core provides semi-quantitative mineralogical data which allows for objective identification and classification of alteration assemblages and domains. The composition and distribution of alteration assemblages can be further refined by pairing the hyperspectral results with rock hardness measurements collected via a handheld rebound device. Within the Ahafo South camp, hanging wall alteration zonation developed within granodiorite and diorite host rocks, displays systematic mineralogical variation as a function of distance to known fluid pathways. Distal alteration is characterized by the conversion of amphibole to Mg-rich chlorite. With increasing proximity to the dominant fluid pathway, primary plagioclase and secondary chlorite are replaced by calcite and phengite. Continuing to approach the primary fluid conduit, Fe-carbonate and ammoniated mica form and phengite transitions to a muscovitic composition. Additionally, there is a shift in the chlorite 2250nm and 2350nm absorption features to longer wavelengths indicating more Fe-rich compositions before chlorite is ultimately altered to muscovite and dolomite. Proximal to fluid conduits within mineralized zones, the alteration assemblage consists of pervasive albite+dolomite+pyrite+gold±quartz with Fe-rich chlorite developed locally in mafic host rocks. This assemblage is characterized by complete destruction of primary textures and increased rock hardness. Though albite and quartz are not hyperspectrally active within the shortwave infrared range, their presence has been confirmed by XRD analysis and petrography and correlated to mineral proxy parameters generated from the hyperspectral data. Establishing a relationship between relative rock hardness and the semi-quantitative mineralogy generated from hyperspectral analysis provides a link to create consistent, multi-parameter, 3D domain models that can influence exploration targeting as well as mining and process related functions.