Swir Analysis of Alteration Assemblages Associated with Porphyry-hosted Gold Mineralization of the Yixingzhai Deposit in the Taihangshan District, North China Craton

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Shortwave infrared (SWIR) reflectance spectroscopy has been widely used to characterize phyllosilicate alteration assemblages associated with ore deposition, and thus may shed significant light on ore genesis and provide guides for mineral exploration. Porphyry-hosted gold mineralization has been recently discovered in the Yixingzhai deposit of the Taihangshan district, North China Craton, where quartz-sulfide lodes have been mined for three decades. It consists of pyrite disseminations and minor thin veinlets in the Early Cretaceous Hewan granite porphyry cut by an NW-trend fault (locally termed F4), with proven reserves of 54.7 t gold at an average of 2.12 g/t. Gold mineralization is associated with extensive hydrothermal alteration. In this study, more than 900 samples from 29 diamond drill holes along three cross-sections that penetrate main orebodies were collected and measured using an Analytical Spectral Devices spectrometer to characterize the alteration assemblages. The results indicate that the ore-related hydrothermal alteration mainly consists of illite, phengite, and muscovite. The wavelength of the Al-OH band (2200 wvl) of those minerals ranges from 2199 nm to 2217 nm, but mostly between 2204 nm and 2212 nm. The 2200 wvl values for these phyllosilicates are negatively correlated with the contents of octahedron Al in the minerals which is a parameter of the pH of the ore-forming fluids. Furthermore, values of 2200 wvl increase outwards from the F4 fault, indicating its role as the structural conduit for the ore fluids. The illite spectral maturity (ISM) for the phyllosilicate minerals ranges from 0.4 to 9.2, with high-ISM samples (ISM > 1) containing gold higher than 0.1 g/t. Results presented here highlight the successful utilization of SWIR reflectance spectroscopy in mineralization and exploration of disseminated gold deposits hosted by igneous rocks.