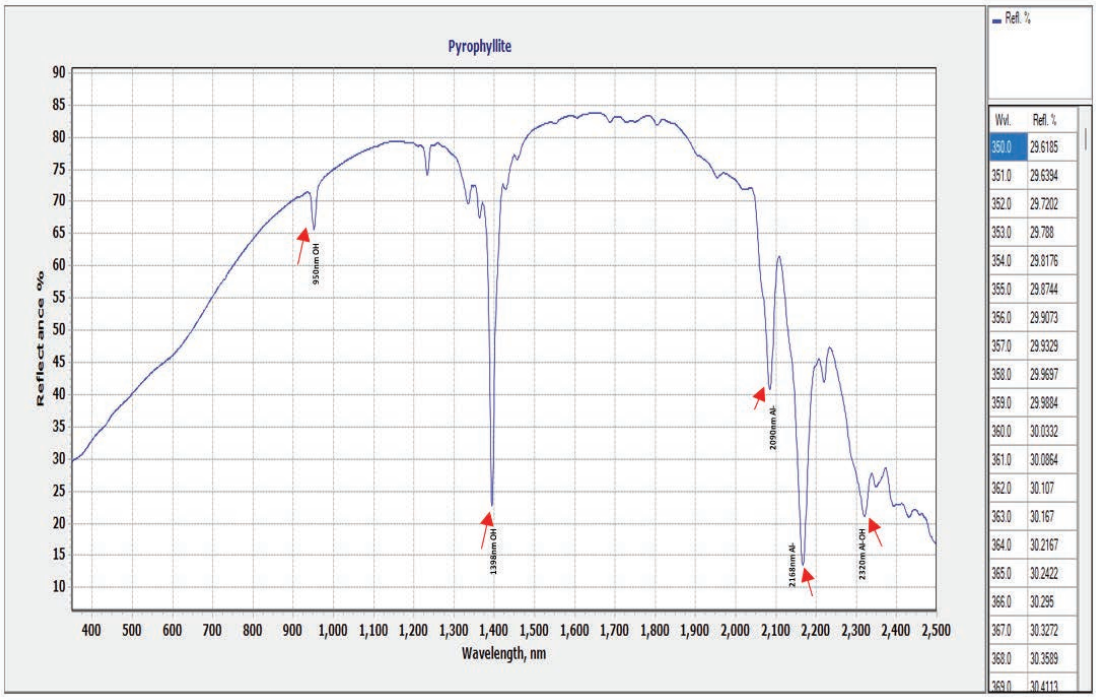
APPLICATION NOTE

Vectoring Tools: Identifying Pyrophyllite with SWIR

A significant portion of the world's gold comes from hydrothermal ore deposits, with epithermal providing up to 13% (Frimmel, 2008). There is widespread hydrothermal alteration in these deposits, and the alteration mineral assemblages provide information on the physico-chemical characteristics of the hydrothermal fluids. According to Watanabe and Hedenquist, hydrothermal pyrophyllite (Al2[Si4O10](OH)2) is formed under medium-/high temperature (280–360°C). An extensive leaching of host rocks by highly acidic hydrothermal fluids causes these deposits to form, generally in zones surrounding the massive silica (vuggy silica) core of high-sulfidation epithermal systems. While it can occur within other environments, (i.e., metapelites with high grades), pyrophyllite is typical of hydrothermal alteration that is influenced by high sulfidation. In high-sulfidation epithermal deposits, pyrophyllite is usually associated with dickite, alunite, and kaolinite. Pyrophyllite can easily be mistaken for talc or white mica in thin sections and hand specimens due to its fine-grained alteration, presenting the need for more precise technology to use in the field and in the core shack.

Using a field portable UV-Vis-NIR spectrometer like the oreXplorer™, pyrophyllite can be easily identified from other minerals in mixtures and used as a vectoring tool based on its crystallinity and temperature changes. As an aluminum-rich hydrous phyllosilicate, pyrophyllite shows a strong OH absorption band at 1398nm and a main Al–OH band at 2168nm. Secondary OH absorption bands close to 950nm and 1230nm, and secondary Al–OH absorption bands at 2090nm and 2320nm are also observed.



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