
Good vibrations in the infra-red: some pilot studies from Newfoundland illustrating the potential of reflectance spectroscopy in economic geology research

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Many common minerals exhibit characteristic absorption spectra for visible and infra-red electromagnetic radiation, and VIRS techniques can identify them and place general constraints on their compositions and relative abundances in natural samples. VIRS is ideally suited to the study of alteration assemblages, in which minerals are commonly very fine-grained or entirely cryptic, and may be difficult to identify from petrography. Portable VIRS instruments are now used extensively in mineral exploration and mining for varied applications, but are not yet standard tools in research-oriented studies. The Geological Survey of Newfoundland and Labrador acquired an ASD Terraspec Pro^R VIRS instrument in 2008, and is now applying it to a variety of problems.

The acquisition of VIRS data is extremely easy and rapid, to the point where proper organization of results and retention of their exact geological/location context becomes a significant consideration. There are automated computer programs that can quickly identify the most abundant responsive mineral species in samples, but our experience suggests that a more systematic assessment of spectra, using human reasoning, is very important to extract the maximum possible amount of data and understand the significance of results. This is particularly true where samples contain more than one responsive mineral, which is commonly the case. As the method is to a large extent empirical, careful use of reference spectra is very important to ensure that minerals are not inadvertently confused. As in conventional petrographic analysis, the first step in systematic assessment of results are knowing what to look for, partly on the basis of known geological associations between mineral species.

To date, several pilot studies have been completed in association with metallogenic studies projects. These include assessment of epithermal-like alteration assemblages in epi-

genetic gold and syngenetic VMS systems, superimposed propylitic and potassic alteration facies in a Mo-Cu porphyry system, skarn-like alteration associated with uranium mineralization, and distinctive “spotty” alteration in sedimentary country rocks near mesothermal gold veins. Each investigation produced interesting results that illustrate the utility of the method, but each also raised some unexpected complications in interpretation of data. In short, these pilot studies provided a valuable and illustrative learning experience that allowed us to improve our systematic procedures for acquisition and interpretation of VIRS data. This rapid and easy technique clearly has great potential as a research tool in economic geology but, like any analytical method, it will always be most useful where it is constrained by other independent types of data such as petrography and lithogeochemistry.