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2015 GSA Annual Meeting in Baltimore, Maryland, USA (1-4 November 2015)

Paper No. 243-3

Presentation Time: 2:05 PM

USING FTIR SPECTROSCOPY OF GEMSTONES TO IMPROVE ANALYTICAL COMPETENCE IN INTRODUCTORY GEOSCIENCE CURRICULA

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The availability of newly-developed, lower-priced spectroscopic instrumentation and the attention of geoscientists to problems that cannot be addressed by classical mineralogical techniques are requiring a shift in the skill sets needed by geoscientists. Although hand sample and polarizing light microscopy remain the cornerstones of classical geological training, many types of spectroscopy provide alternatives for mineral identification. Here we describe a lab that provides an introduction to Fourier Transform InfraRed (FTIR) spectroscopy that leverages students' innate curiosity about gemstones. We use a Bruker Alpha portable spectrometer that allows a student to place a >5 mm sample in front of a small window to obtain data. Using that instrument, we have created a >1200-sample reflectance library of data that includes numerous spectra of naturally-occurring and treated gemstones. Either the Bruker proprietary Opus software or our own freeware web-based search routine can be used to identify minerals.

The lab begins with a discussion of the causes of color in minerals and provides an explanation of standard gemstone treatments in the jewelry industry. Learning goals include 1) identification of gemstones using the search and match software, 2) familiarity with the instrument and its software 3) understanding the chemistry of color, and how treatments modify color, 4) appreciation of the effect of changing chemical composition on peak position, and 5) appreciation of the importance and limitations of databases. Different portions of the lab support student learning in several areas. One section asks students to read an article from *Gems and Gemology* on enhancements, acquire data on a few different gems, and then distinguish among specific treatments vs. naturally colored gems. Another looks at samples of the same mineral with different colors vs. the same color from different minerals, to engage students in consideration of differences between visible and IR wavelengths. A third section presents students with samples from the same mineral group with varying compositions, to illustrate peak shifts with chemistry.

This lab and others we are creating for this spectrometer pave the wave for more field-based use of spectroscopy in geoscience teaching and research.

Session No. 243

[T90. Undergraduate Geoscience Education and Research Opportunities Supported by NSF Funding Programs](#)

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