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Portable Raman spectrometry - A versatile tool for the identification of archeological materials

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On site, destruction free and quick identification of solid phases in general and minerals in particular is important in a variety of applied mineralogy fields, such as gemmology, mineral prospection or archeometry. Raman spectroscopy is a popular method for identification purposes. Most spectrometers available on the market, however, are due to their weight, difficult to transport and are not suitable for an outdoor use. The conventional spectrometer set-up depends on movable optic parts and requires calibration after transport.

The portable Raman spectrometer that will be presented is based on a novel optical setup combining properties of Fourier transform spectrometers with the compact assembly of a dispersive polychromator. The excitation wavelength is 532 nm and the spectral range corresponds to 150 up to 1200 wavenumbers at 20 wavenumbers spectral resolution, suitable to identify most minerals. The device including excitation source and probe weighs about 4 kg and is operated using a laptop computer via USB. The probe uses the confocal optical setup with a spatial resolution of about 10 micron. and allows measurements on almost any accessible surface.

A prototype of the portable spectrometer was used to analyze on-site the pigments present in fresco images of the medieval church of Treyvaux, Fribourg, Switzerland, and for the analysis of gemstones. The Optegon Raman system can easily be adapted to commercial microscopes using the beam path for fluorescence microscopy and can be operated as table top micro Raman spectrometer.