

## FT-Raman quantitative analyses of multi-minerallic carbonate bearing powders

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In this study Raman spectroscopy has been employed to quantify powdered multi-minerallic magnesium and calcium carbonate assemblages. The mineral assemblages investigated consisted of hydromagnesite, huntite, dolomite, magnesite and calcite, for which Raman band assignments are relatively well known. The portable Raman spectrometer (Perkin Elmer, Identichack) employed in this study is fitted with a 785nm laser. The powdered samples were measured through polyethylene bags. The internal mode  $\nu_1$  assigned to the  $\text{CO}_3$  symmetrical stretch for calcium and magnesium carbonates gave the strongest intensity peaks and thus was chosen for quantitative work. All peaks are positioned in the  $1130\text{-}1080\text{cm}^{-1}$  region, and closely overlap. The peak amplitude representing intensity of Raman scattering for individual carbonate minerals was plotted against known weight ratios of constructed internal standards. X-Ray powder diffraction (XRD) quantification data and standard addition methods were employed to validate their accuracy. Raman data manipulation was undertaken using the software packages Spectrum (Perkin Elmer) and PeakFit (Jandel Scientific), and was used to deconvolute overlapping peaks by the Gaussian Lorentzian method. The sample particle size was monitored by scanning electron microscopy (SEM) and laser diffraction. The major components in multiple mixtures showed good linear calibration graphs.  $R^2$  values are greater than 0.95 for hydromagnesite, dolomite and huntite values are 0.99 and 0.98 respectively and the detection limits for minor components are typically 2% or better. This suggests that a five way calibration program for mixed assemblages of Ca-Mg carbonates can be achieved using the  $\nu_1$  vibration of the carbonate anion for the different respective mineral species.