University of Colorado Boulder

Raman Microspectroscopy Laboratory
Dept. of Geological Sciences
Directed by Prof. Alexis Templeton
http://goo.gl/mlBTDZ0

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Raman Spectroscopy:

- Vibrational spectroscopic technique
  - Gives information about covalent chemical bonds

- Uses visible laser light to interrogate molecular structure
  - Non-destructive, fast, and usually requires very little sample preparation

- Identify materials such as compounds, minerals, polymers, complex mixtures
  - Solids, liquids, cells, suspensions, gasses

- Map the spatial distribution of phases/compounds of interest

- Characterize chemical/structural differences
  - Chemical substitution, crosslinking, strain, structural damage
We can collect hyperspectral images by collecting full Raman spectra at tens of thousands of points to give us insight into the spatial distribution of components/spectral characteristics. Multivariate statistical tools allow advanced analysis of complex map datasets.

• High quality spectra are usually collected in 5 minutes or less.
• Spot size can be adjusted from around 1 µm to 5 µm or larger.
• The area that can be efficiently mapped is up to around 4 mm².
• 532 nm and 785 nm lasers are available.
• Confocal optics capable of depth profiling and 3D mapping.
• Additional lab resources:
  • FTIR microscope and spectrometer
  • Stereomicroscope and sample preparation area/supplies
  • Data processing workstation computer with advanced multivariate statistical analysis and image processing capabilities.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Routinely achievable</th>
<th>Best-case scenario</th>
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<tbody>
<tr>
<td>X and y spatial resolution</td>
<td>1 µm</td>
<td>~350 nm</td>
</tr>
<tr>
<td>Z confocal depth resolution</td>
<td>2 µm</td>
<td>1 µm</td>
</tr>
<tr>
<td>Spectral resolution</td>
<td>2.5 cm⁻¹</td>
<td>0.4 cm⁻¹</td>
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Getting Started:

- Send Eric an email to schedule a brief meeting to discuss what you have in mind.
- We can often run a quick test at that time, so bring a representative sample!
- Less is more in terms of sample prep!
- After initial explorations, you will have access to the instrument calendar to schedule additional time.
- The Raman Facility has an established user rate of $45/hr, with a max $225/day (i.e. overnight mapping). It is inclusive of significant computational time and assistance processing spectral datasets/hyperspectral maps.