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# Mid-Infrared Reflectance Spectroscopy based on External Cavity Quantum Cascade Lasers for Mineral Characterization

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## Supplemental Material

### ECQCL MIR Spectra of Common Minerals

The following figures support the discussion regarding the spectra taken on different common minerals.

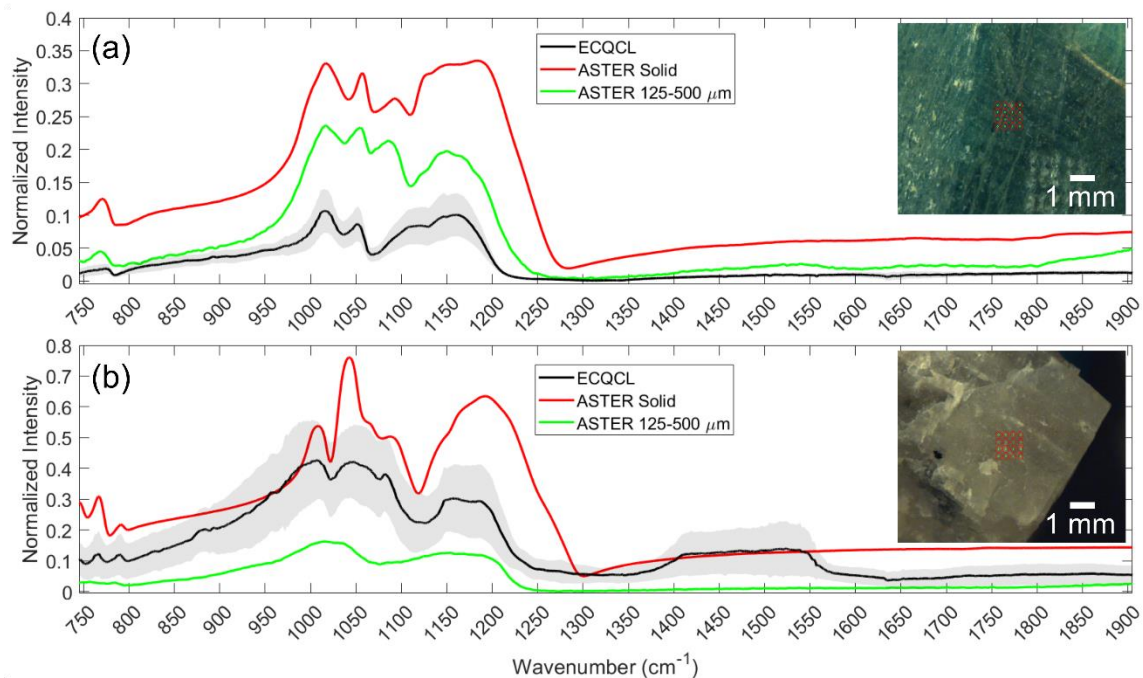


Figure S1. Average spectra taken on (a) k-feldspar and (b) albite shown as black lines. The shaded area represent  $\pm$  one standard deviation. Both mineral ASTER spectra are shown for solid rock in red and for 125–500  $\mu\text{m}$  particle size in green.

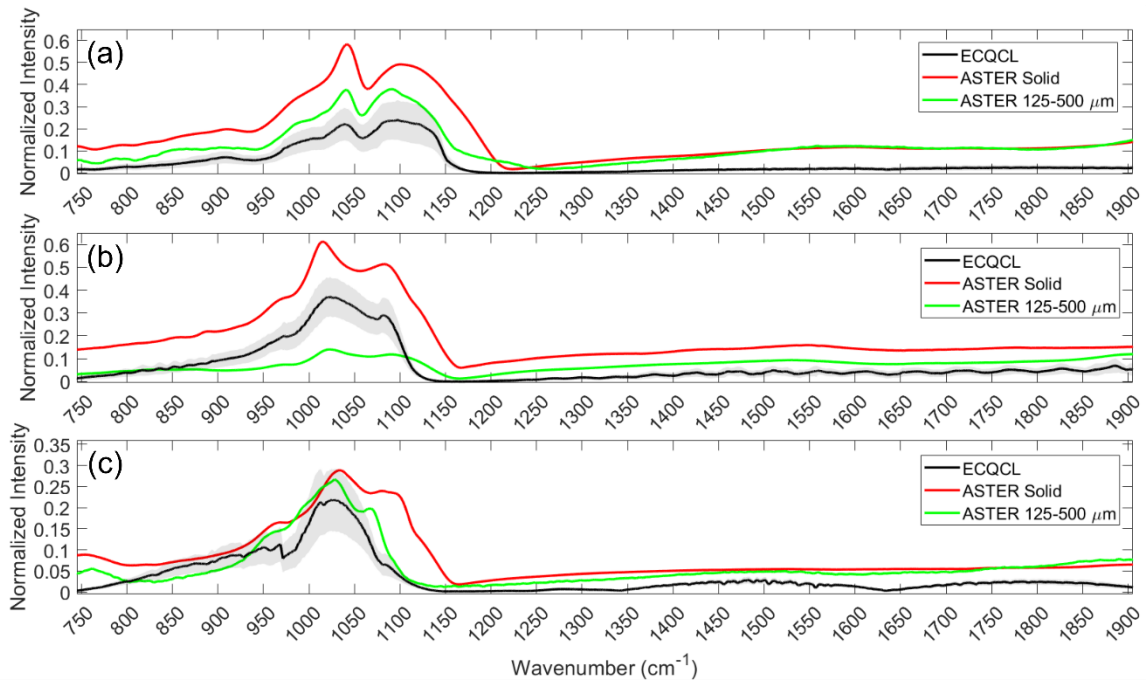


Figure S2. Average spectra taken on (a) muscovite, (b) biotite, and (c) chlorite shown as black lines. The shaded area represent  $\pm$  one standard deviation. All mineral ASTER spectra are shown for solid rock in red and for 125–500  $\mu\text{m}$  particle size in green.

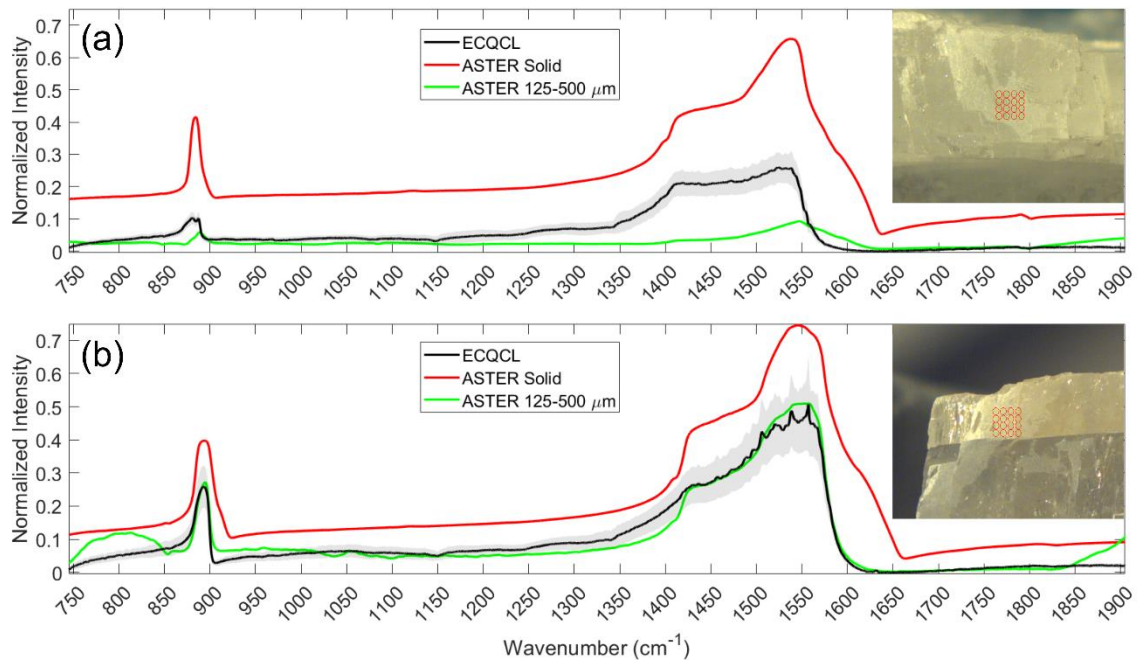


Figure S3. Average spectra taken on (a) calcite and (b) dolomite shown as black lines. The shaded area represent  $\pm$  one standard deviation. Both mineral ASTER spectra are shown for solid rock in red and for 125–500  $\mu\text{m}$  particle size in green.

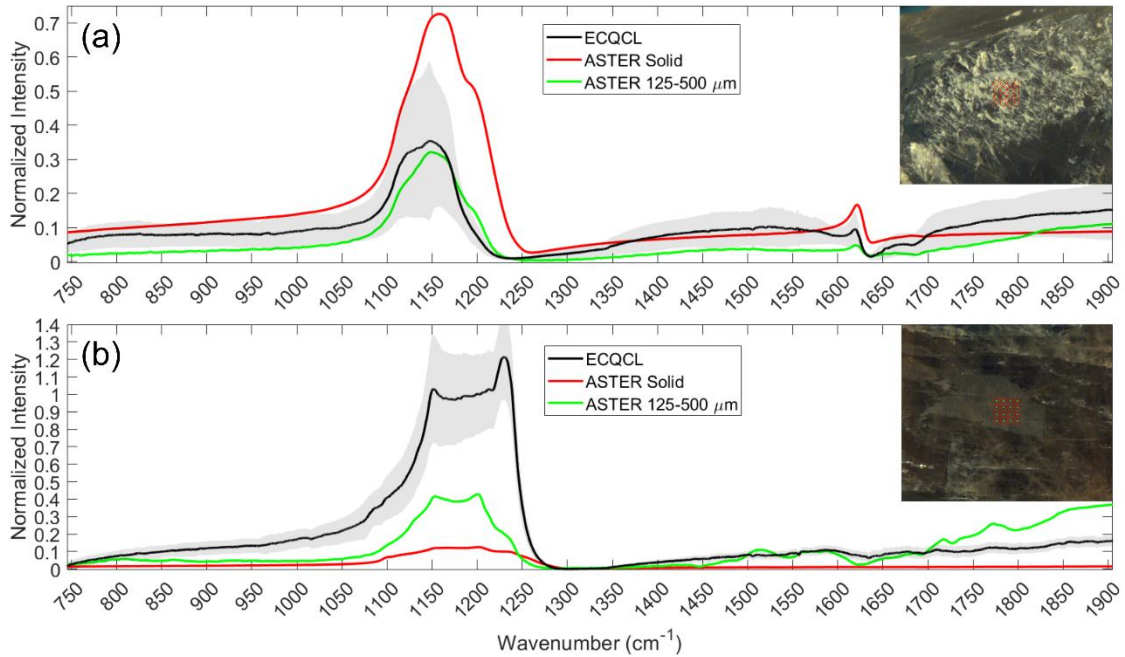


Figure S4. Average spectra taken on (a) gypsum and (b) anhydrite shown as black lines. The shaded area represent  $\pm$  one standard deviation. Both mineral ASTER spectra are shown for solid rock in red and for 125–500  $\mu\text{m}$  particle size in green.

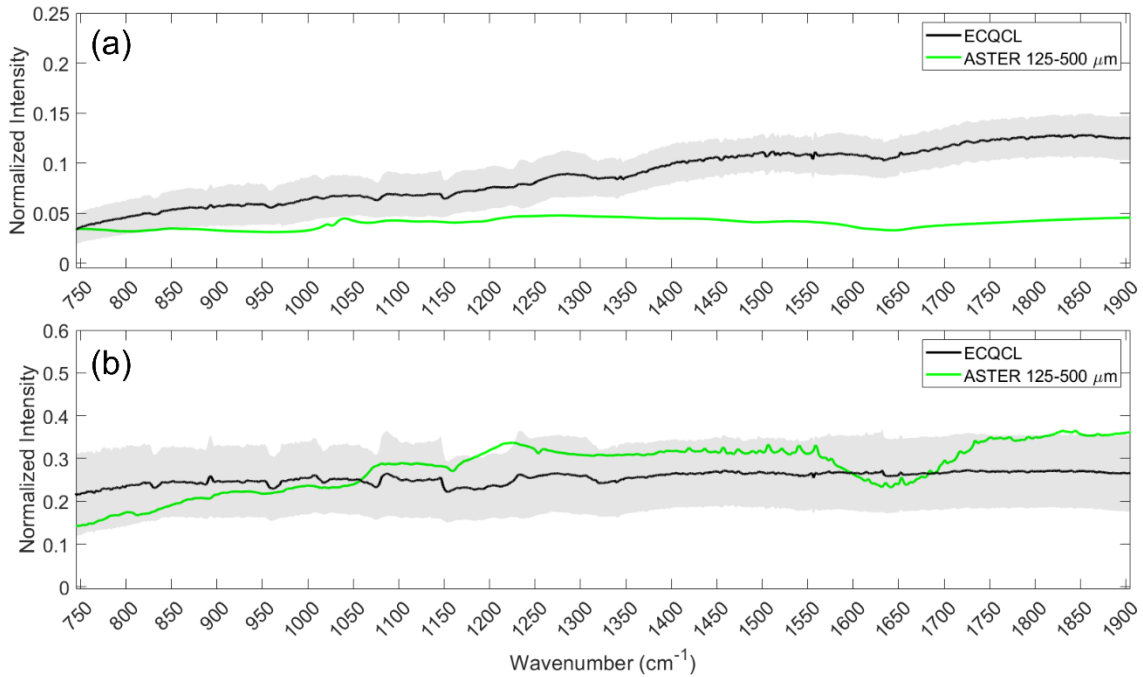


Figure S5. Average spectra taken on (a) pyrite and (b) chalcopyrite shown as black lines. The shaded area represent  $\pm$  one standard deviation. Both mineral ASTER spectra are shown for 125–500  $\mu\text{m}$  particle size in green.



## ECQCL MIR Spectra of Common Minerals Taken at Different Incident Angles

The following figures support the discussion regarding the spectra taken at different incident and collection angles.

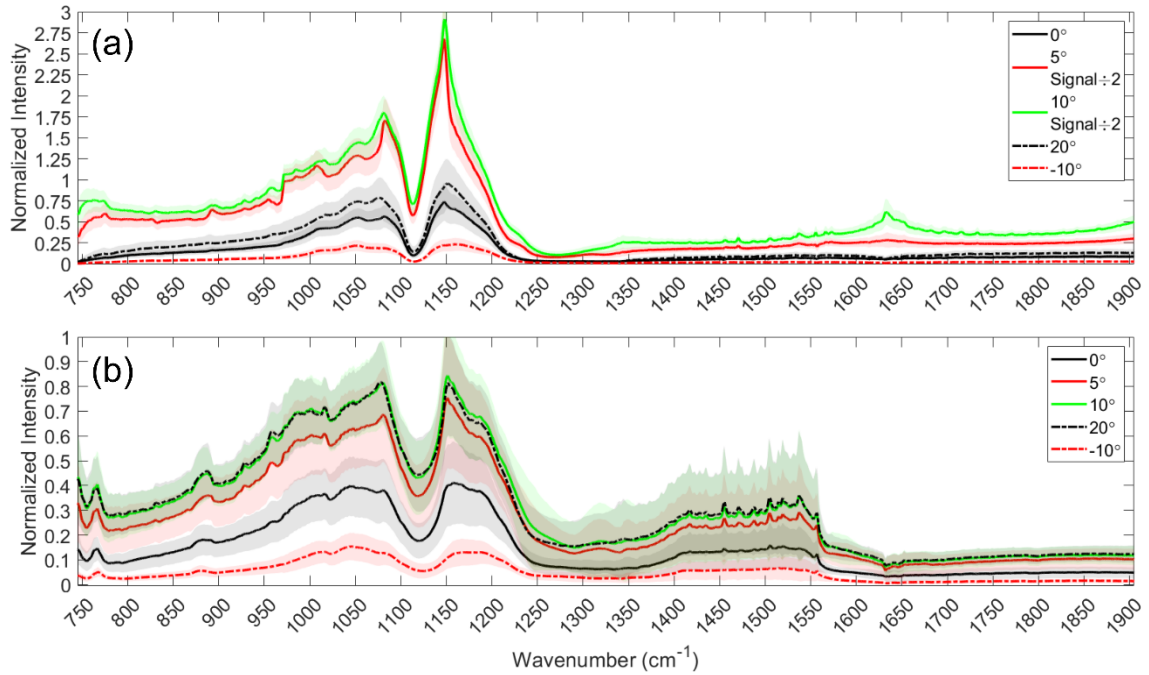


Figure S6. Average spectra taken on (a) k-feldspar and (b) albite at an incident angle  $i$  of 0°, 5°, 10°, 20°, and -10° from the normal. The shaded area represent  $\pm$  one standard deviation.

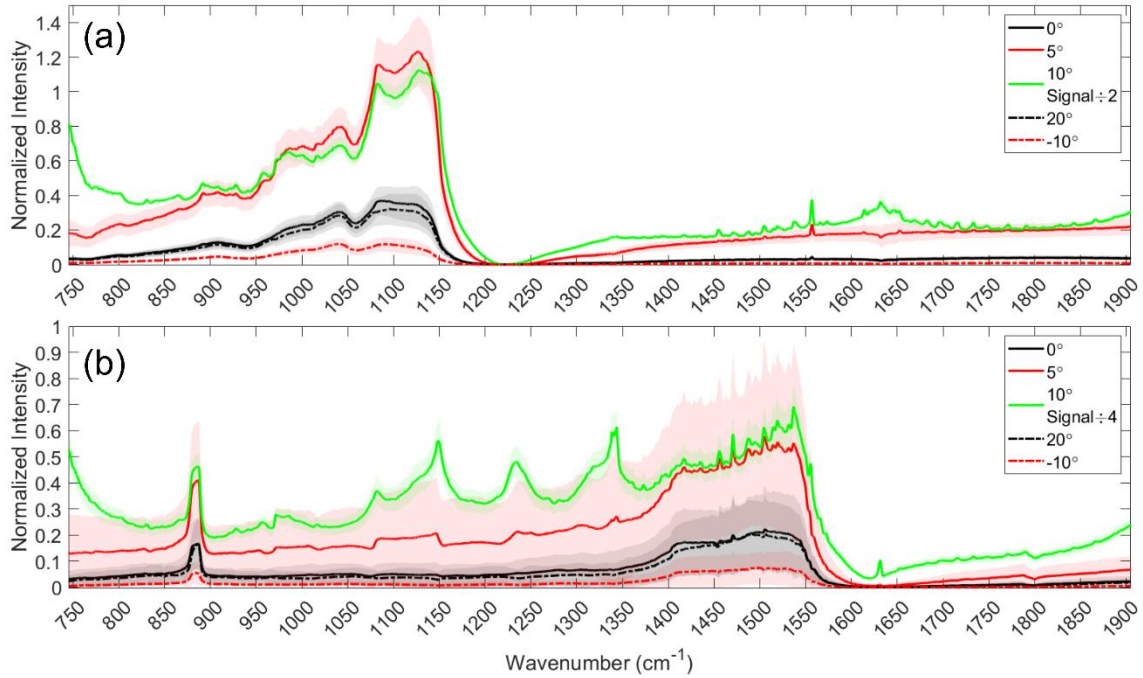


Figure 7. Average spectra taken on (a) muscovite and (b) calcite at an incident angle  $i$  of  $0^\circ$ ,  $5^\circ$ ,  $10^\circ$ ,  $20^\circ$ , and  $-10^\circ$  from the normal. The shaded area represent  $\pm$  one standard deviation.