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Polarised Terahertz Reflectance and Terahertz Transmission of Calcite

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While the optical properties of calcite are well known in the visible region, that same cannot be said of the terahertz region. Campbell *et al.* [1] have reported attenuated total reflectance (ATR) spectra. Sakai *et al.* [2] used pulsed terahertz radiation ATR. ATR has the attraction of experimental simplicity; however, the results are not always easy to interpret, nor is information related to the polarisation routinely obtained. We have recently reported detailed polarised spectra from single-crystal calcite at near-normal incidence [3]. These data reveal a systematic variation in features with polarisation angle. With respect to transmission geometry, Mizuno *et al.* [4] analysed calcium carbonate transmission in the range 0.5-4 THz. They noted that the features at 2.12, 2.23 and 2.40 THz varied in intensity on rotating the angle of polarisation of the incident radiation. We have now supplemented our detailed reflection data on crystalline calcite with transmission data on powdered calcite to obtain a fuller picture of the many phonon features. We expect measurements at low temperature will improve this data further.

[1] S. Campbell, B. Gao, and K. M. Poduska, "Mid- and far-infrared spectral links for calcium carbonate polymorphs,"*IRMMW-THz Conference*, 2020.
[2] S. Sakai et al., "Pulsed terahertz radiation for sensitive quantification of carbonate material,"*ACS Omega*, **4**, 2702-2707, 2019.
[3] R. E. M. Vickers and R. A. Lewis, "Polarised Terahertz Spectroscopy of Calcite,"*IRMMW-THz Conference*, 2025.
[3] M. Mizuno, K. Fukunaga, S. Saito, and I. Hosako, "Analysis of calcium carbonate for differentiating between pigments using terahertz spectroscopy,"*Journal of the European Optical Society –Rapid Pubs.*, **4**, 09044, 2009.

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