

Dielectric properties of 2D water confined in gypsum.

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Abstract

We investigated how two-dimensional (2D) water sheets behave when confined within the layered mineral gypsum. Our observations revealed that the O-H stretching modes of water localise on two types of O-H dipoles, which exhibit distinct vibration frequencies due to varying hydrogen bonding strengths. This allowed us to independently study the dielectric behaviour of these confined O-H dipoles, which show a distinct vibrational anisotropy, indicating the orientation of O-H dipoles within the 2D confinement. By analysing the vibration frequency under different confinement geometries of O-H dipoles in the presence of external electric field, we uncovered the dielectric polarization of nanoconfined water.