

## Single crystal elastic properties of hemimorphite

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Hemimorphite ( $\text{Zn}_4\text{Si}_2\text{O}_7(\text{OH})_2 \cdot \text{H}_2\text{O}$ ) as hydrous mineral contains two different types of bonded hydrogen: molecular water and hydroxyl. The elastic properties of hemimorphite have been investigated by Brillouin spectroscopy at ambient condition. Nine independent single-crystal elastic moduli ( $C_{ij}$ ) of hemimorphite have been obtained. The root mean square (RMS) error for best-fit model of the  $C_{ij}$  tensor is 32.4 m/s. The Voigt-Reuss-Hill averaged aggregate isotropic elastic moduli are  $K_s(\text{VRH}) = 73.9 \pm 2.7 \text{ GPa}$  and  $\mu(\text{VRH}) = 26.52 \pm 0.10 \text{ GPa}$ , for the adiabatic bulk modulus and shear modulus, respectively. The average P velocity is 5.601 km/s, and for S velocity is 2.760 km/s. Hemimorphite has distinctive acoustic properties for: (i) strong anisotropy, especially for  $V_s$  (46.924%); (ii) a high  $V_p$  to  $V_s$  ratio ( $V_p/V_s = 2.02$ ). The maximum  $V_p/V_s$  is in the (010) plane, which contains both varieties of “water”; (iii) and a large Poisson’s ratio ( $\sigma = 0.345$ ).