

## **Integral molar absorptivities of OH in muscovite at 20 to 650 °C by in-situ high-temperature IR microspectroscopy**

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### **ABSTRACT**

The change with temperature of IR absorption bands in OH in muscovite was studied using unpolarized in-situ high-temperature infrared microspectroscopy. The molar absorption coefficient  $\epsilon$  at  $3628\text{ cm}^{-1}$  for OH in muscovite at room temperature ( $20\text{ }^{\circ}\text{C}$ ) has been determined to be  $127 \pm 6\text{ L/mol}\cdot\text{cm}$ . Using the orientation factor  $\gamma = 0.47$  for the angle between OH vector and  $c^*$  axis ( $75 \pm 5^{\circ}$ ), the true molar absorption coefficient  $\epsilon$  at  $3628\text{ cm}^{-1}$  is determined to be  $270 \pm 10\text{ L/mol}\cdot\text{cm}$  at  $20\text{ }^{\circ}\text{C}$ . Integral molar absorptivities are also determined from 20 to  $650\text{ }^{\circ}\text{C}$  showing no weight loss. The value decreases from  $7060 \pm 190\text{ L/mol}\cdot\text{cm}^2$  at  $20\text{ }^{\circ}\text{C}$  to  $5190 \pm 270\text{ L/mol}\cdot\text{cm}^2$  at  $650\text{ }^{\circ}\text{C}$  (26% decrease). OH orientation of muscovite sample measured by polarized IR microspectroscopy at  $20\text{ }^{\circ}\text{C}$  showed that the angle between the projection of OH vector to (001) plane (the OH' vector) and  $b$  axis is  $30.5^{\circ}$  at  $20\text{ }^{\circ}\text{C}$  and did not change greatly at higher temperatures until  $650\text{ }^{\circ}\text{C}$ . The tilting of OH dipoles toward the  $c^*$  axis from  $75^{\circ}$  to about  $43^{\circ}$  while keeping the same angles along  $b$  axis would explain the observed decrease in integral molar absorptivities at higher temperatures, but further studies are needed to clarify the OH behavior at high temperatures.

**Keywords:** Muscovite, OH, in-situ high-temperature IR microspectroscopy, integral molar absorptivity, OH orientation