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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 ε at 3628 cm^{-1} for OH in muscovite at room temperature (20 °C) has been determined to be 127 ± 6 L/mol·cm. Using the orientation factor $\gamma = 0.47$ for the angle between OH vector and **c*** axis (75 ± 5°), the true molar absorption coefficient ε at 3628 cm^{-1} is determined to be 270 ± 10 L/mol·cm at 20 °C. Integral molar absorptivities are also determined from 20 to 650 °C showing no weight loss. The value decreases from 7060 ± 190 L/mol·cm^2 at 20 °C to 5190 ± 270 L/mol·cm^2 at 650 °C (26% decrease). OH orientation of muscovite sample measured by polarized IR microspectroscopy at 20 °C showed that the angle between the projection of OH vector to (001) plane (the OH′ vector) and **b** axis is 30.5° at 20 °C and did not change greatly at higher temperatures until 650 °C. The tilting of OH dipoles toward the c* axis from 75° to about 43° 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