Pressure dependence of micro-Raman mass spectrometry for carbon isotopic composition of carbon dioxide fluid

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Using Raman-spectroscopy to measure carbon isotopic ratios of CO_2 fluid

Micro-Raman spectroscopy can find the carbon isotopic ratio of CO_2 fluid from the ratio of intensity of a $^{13}CO_2$ peak to that of a $^{12}CO_2$ peak.[1] To evaluate the applicability of the intensity ratio to the analysis of natural CO_2 fluid inclusions, we investigated the pressure-dependence of intensity ratios.

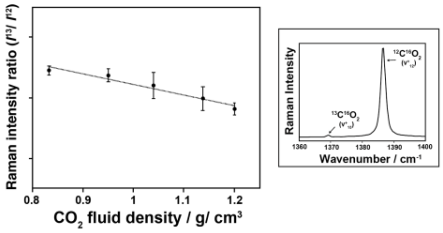

Figure.1: I^{13}/I^{12} for Raman spectra of CO_2 at 10, 25, 50, 100, and 150 MPa at room temperature, approx. 22°C

Result and discussion

When changing fluid pressure from 10 to 150 MPa, the ratios of intensity shows negative correlation with fluid pressure. Pressures of two types affect the Raman spectrum of CO_2 peaks, affecting the peak position and peak shape. To evaluate effects on the peak position, we repeatedly measured the intensity ratio at constant CO_2 pressure (10 MPa) with movement of the grating center position. Although we moved it, no significant correlation was observed for ratio of intensity. The pressure effect on the ratios can be corrected by ascertaining the CO_2 pressure.[2] Combination with the Raman spectroscopic barometry for CO_2 enables analyses of $\delta^{13}C$ of CO_2 using the intensity ratio of CO_2 Raman peaks.

[1]Arakawa et al. (2007) *Appl. Spectrosc*, **61**, 701-705
[2]Kawakami et al. (2003) *Appl. Spectrosc*, **57**, 1333-1339