

Raman spectra of gas-mixture in fluid inclusions: effect of quartz birefringence on composition measurement

Wenjing Wang^{1,2}, <u>Marie-Camille Caumon²</u>, Alexandre Tarantola²

¹ Key Laboratory of Tectonics and Petroleum Resources of Ministry of Education, Faculty of Earth Resources, China University of Geosciences, Wuhan 430074, China
²Université de Lorraine, CNRS, CREGU, GeoRessources Laboratory, BP 70239, F-54506 Vandoeuvre-lès-Nancy, France E-mail: marie-camille.caumon@univ-lorraine.fr,

The composition of the gas mixture in fluid inclusions is one of the most important properties to obtain physical and chemical information of geofluids. Raman spectroscopy is a powerful tool for the quantitativeanalysis of the composition of the fluids trapped in inclusions. The peak area of each species is directly linked to concentration by its Raman scattering cross section (RSCS). However, previous studies showed that the peak area ratio of gases changed with gas mixture composition at the same P-T conditions^{1,2}, indicating that RSCS is not a constant. Besides, previous studies proved the effect of host mineral birefringence on the shape of the stretching vibration band of liquid water, having an impact on the quantitative determination of salinity³, but

the influence on gas-mixture inclusions is still unknown.

In this study, the Raman signals of CO_2 -CH₄ and CO_2 -N₂ in natural fluid inclusions in quartz were collected and compared to microthermometry data⁴. It showed sinusoidal variations of the peak area ratio (ACH₄/ACO₂, ACO₂/AN₂) with the rotation of the samples on the microscope stage with a period of 45°. On the contrary, the area



ratio of the two peaks of CO_2 (v_{1380}/v_{1280}) and the Fermi diad split remained constant with sample rotation. These phenomena are probably linked to the birefringence of the host mineral as observed for liquid water³.

- [1] Seitz J., Pasteris J., American Journal of Science, **1993**, 293, 297–321.
- [2] Seitz J., Pasteris J., Chou I.-M., American Journal of Science, 1996, 296, 577–600.
- [3] Caumon M.-C., Tarantola A., Mosser-Ruck R., Journal of Raman Spectroscopy, 2015, 46, 969–976.
- [4] Tarantola A., Mullis J., Vennemann T., Dubessy J., de Capitani C., Chemical Geoogy, 2007, 237, 329-357