



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

Marie-Camille Caumon, Wenjing Wang, M-C Caumon, A. Tarantola

### ► To cite this version:

Marie-Camille Caumon, Wenjing Wang, M-C Caumon, A. Tarantola. Raman spectra of gas-mixture in fluid inclusions: effect of quartz birefringence on composition measurement. XIII GeoRaman Conference, Jun 2018, Catania, Italy. pp.200. hal-02161802

**HAL Id: hal-02161802**

**<https://hal.science/hal-02161802>**

Submitted on 21 Jun 2019

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



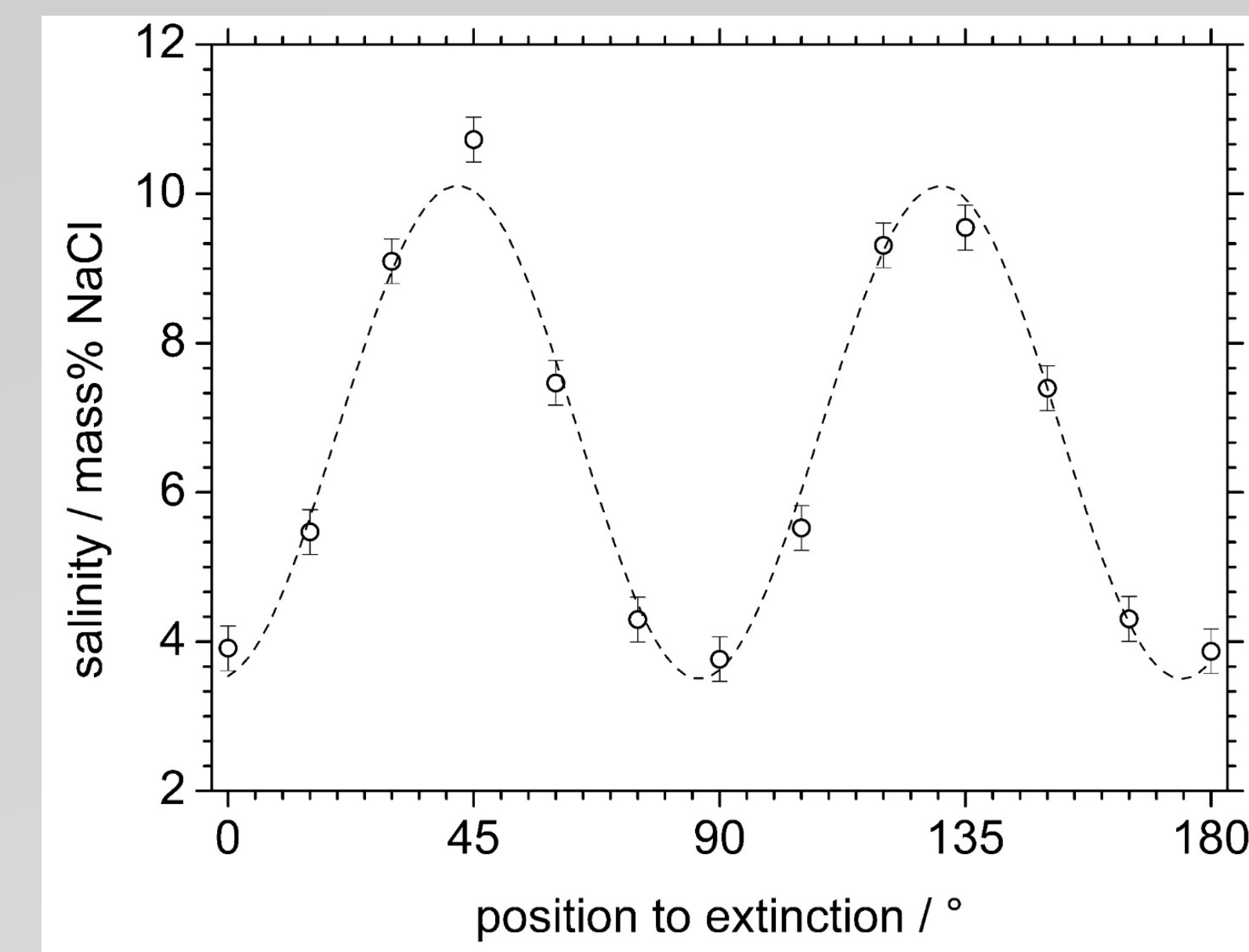
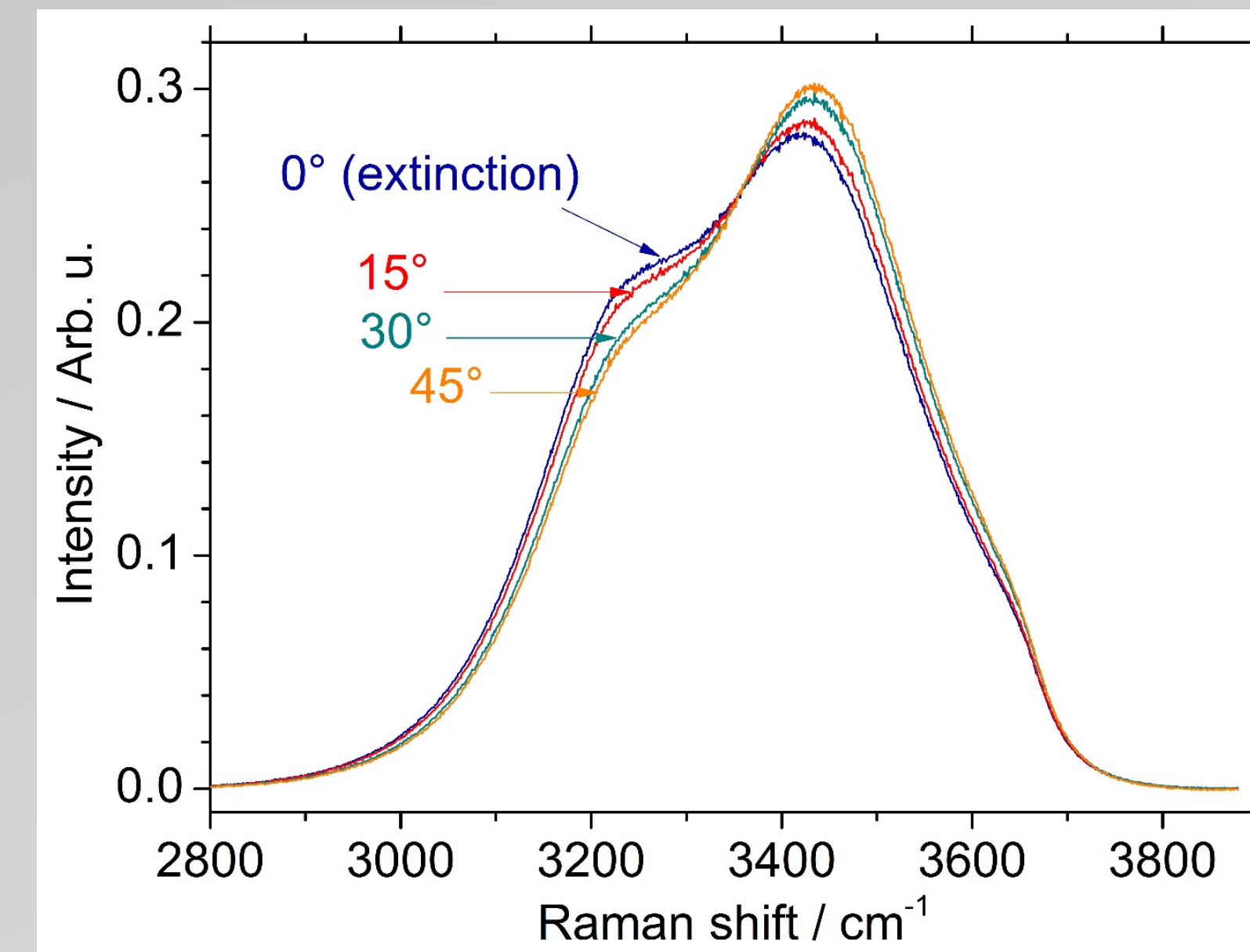
# Raman Spectra of Gas Mixtures in Fluid Inclusions: Effect of Quartz Birefringence on Composition Measurement

W Wang<sup>1,2</sup>, M-C Caumon<sup>1</sup>, A Tarantola<sup>1</sup>

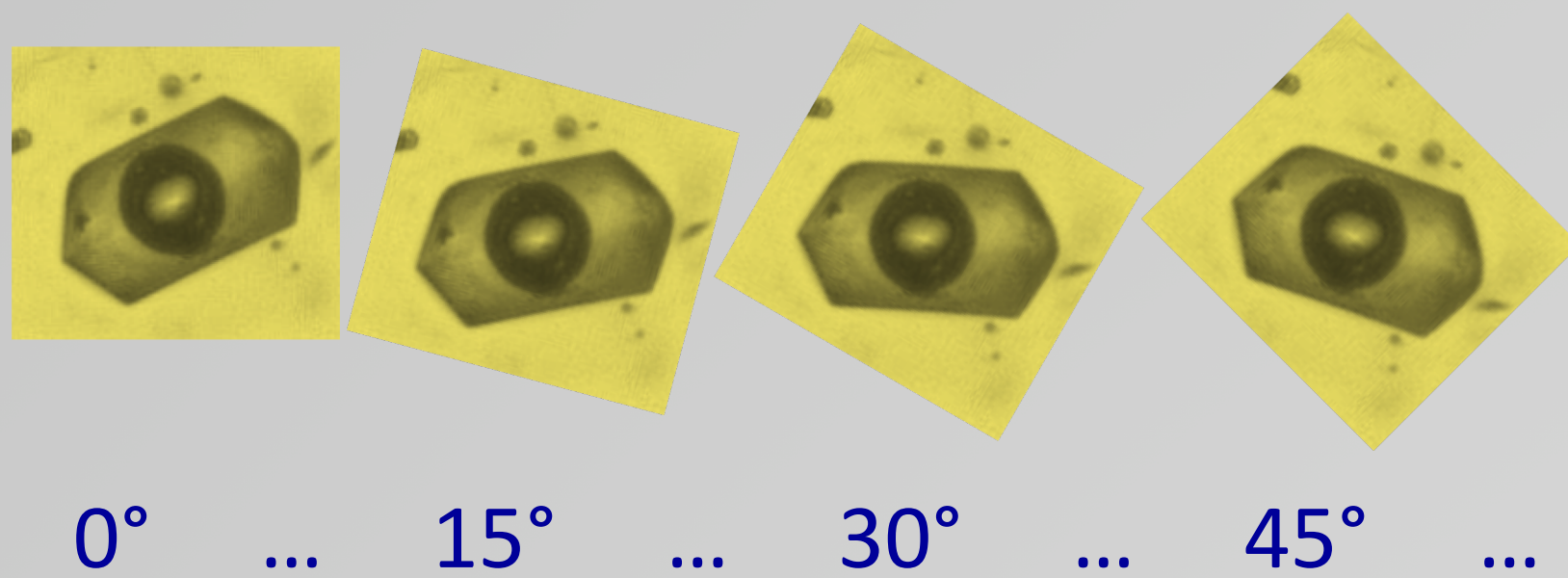
## Context

- Composition of the gas phase of fluid inclusions
- Quantitative measurement by Raman spectroscopy
- Effect of host mineral birefringence on Raman intensity: example of salted water

Is there an effect of host mineral birefringence on the relative peak areas of gases?

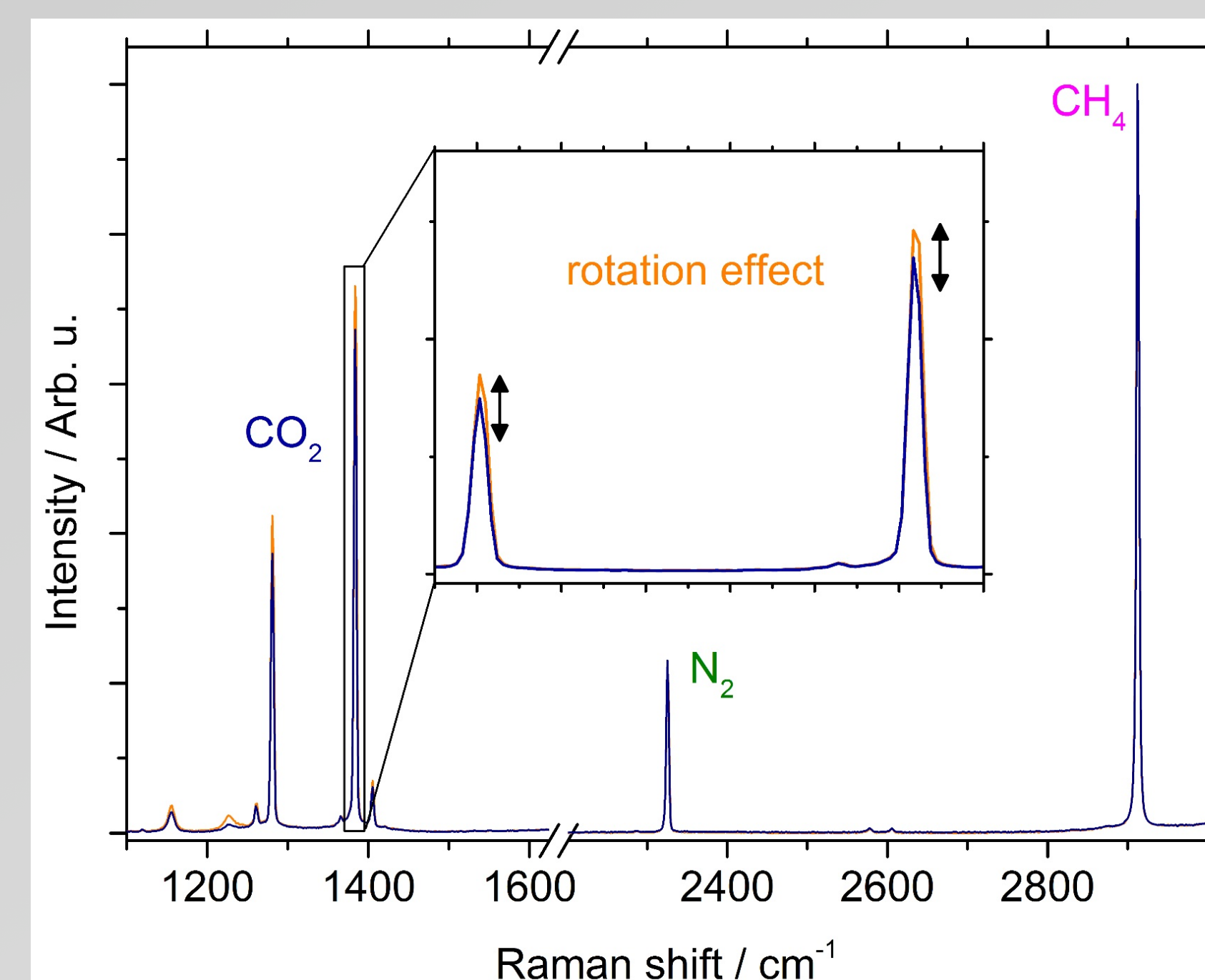


Caumon et al., Eur J Mineral 2013 & J Raman Spec 2015



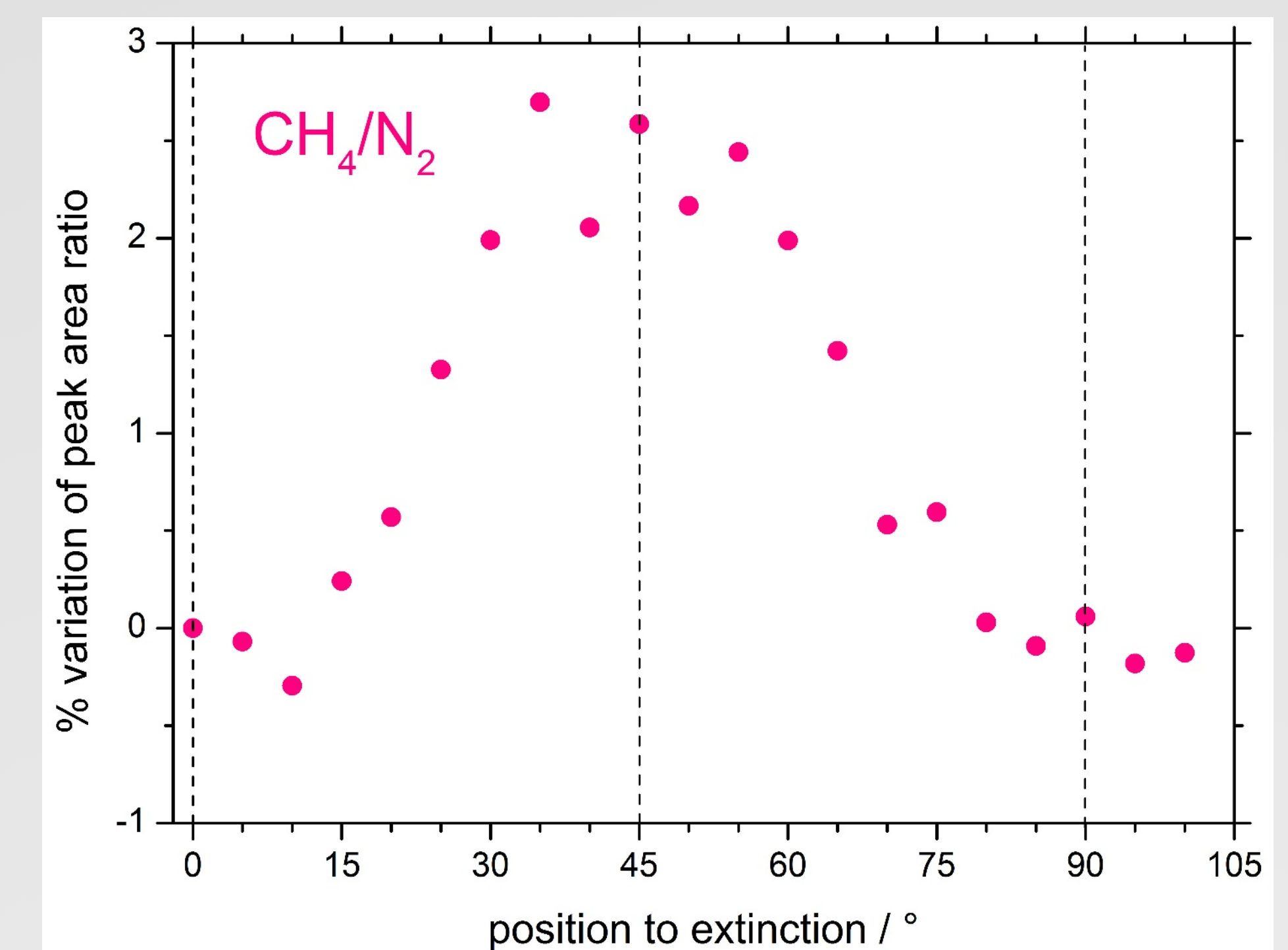
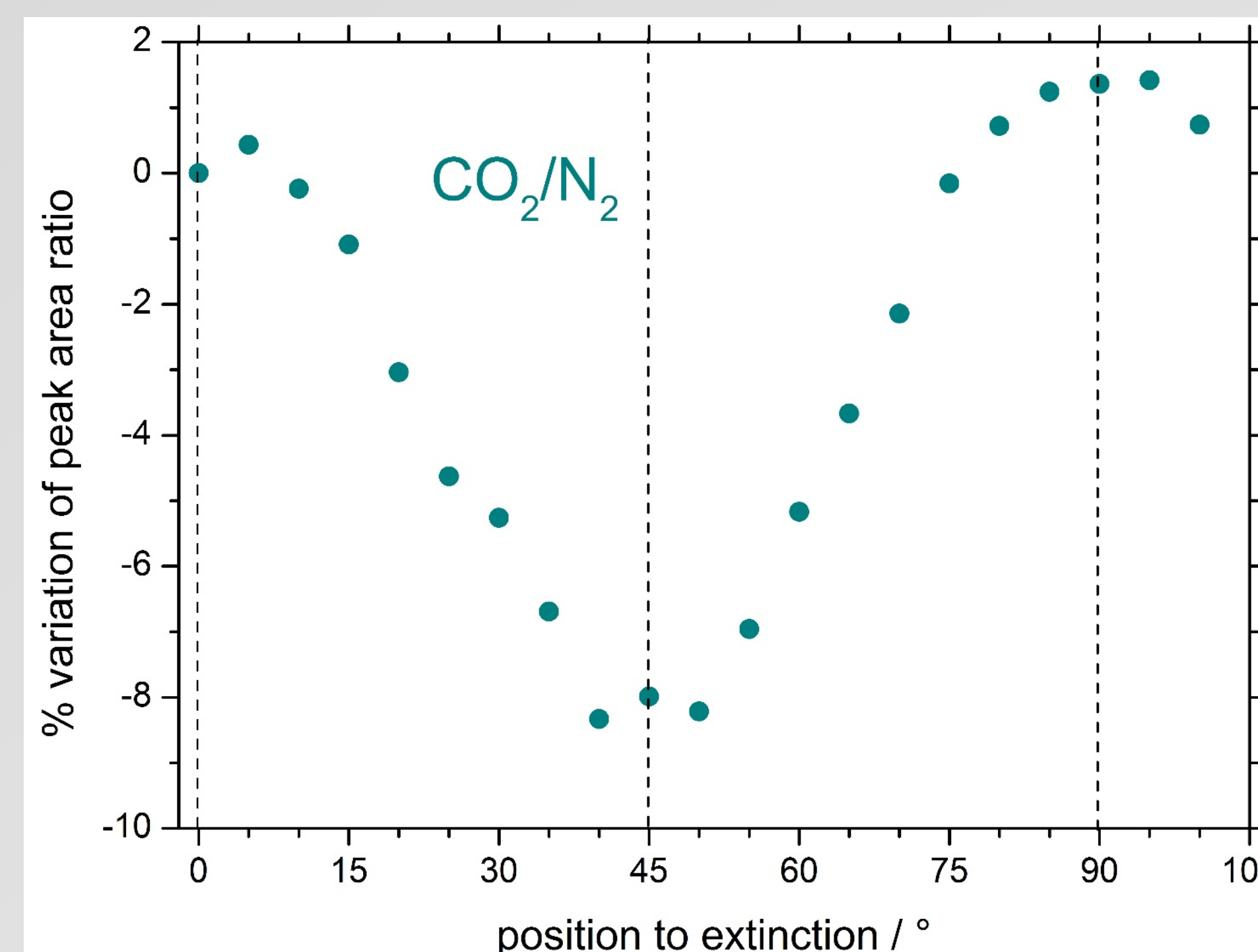
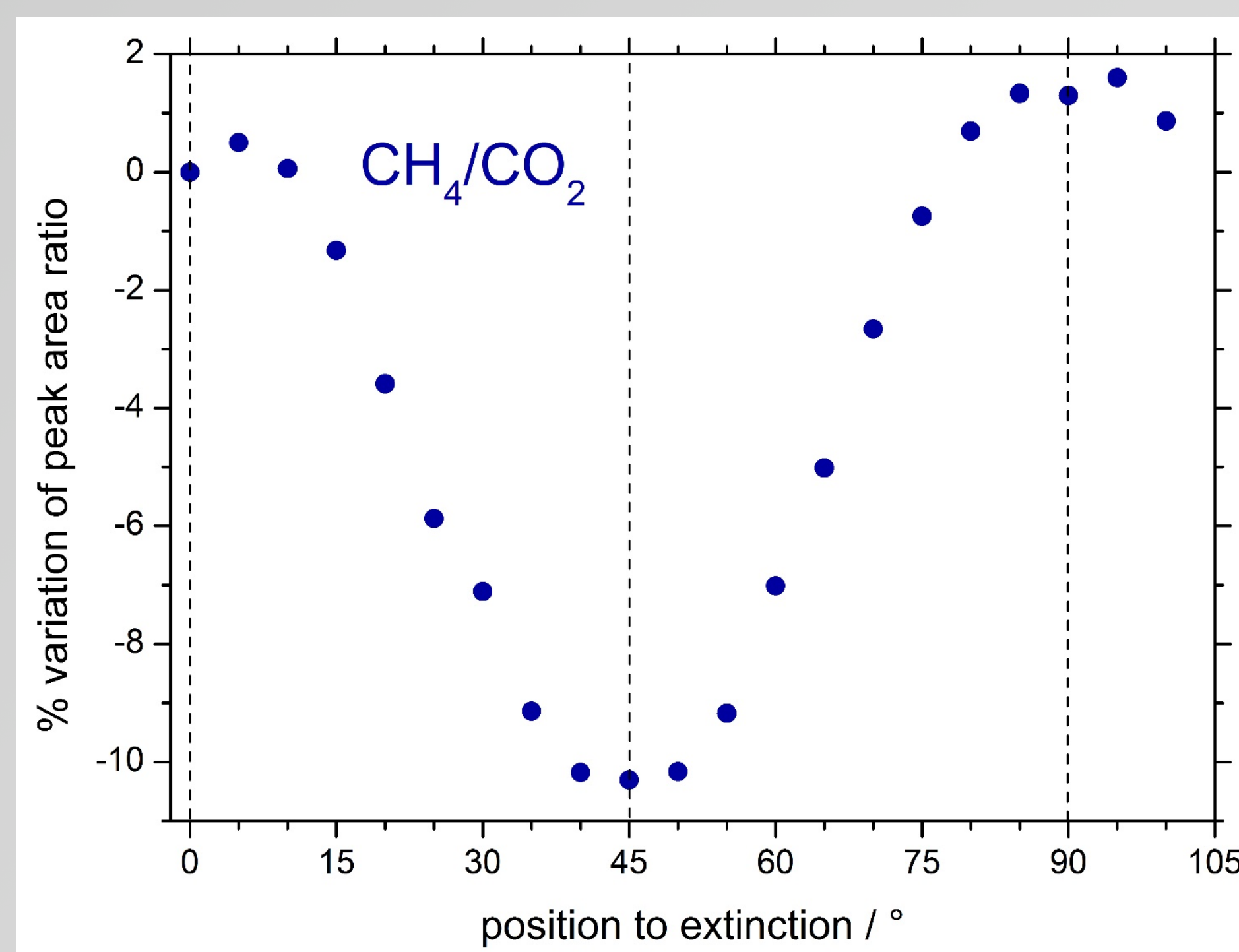
0° ... 15° ... 30° ... 45° ...

Sample rotation by step of 5°



## Methodology

- Fluid inclusions in quartz with CO<sub>2</sub>, N<sub>2</sub> and/or CH<sub>4</sub> in the gas phase
- Raman spectra recorded from mineral extinction position to 100° by steps of 5°
- Calculation of peak area ratio
- Repeated measurements: peak area ratio ± 1%



Gas phase composition: CO<sub>2</sub> 76-78 mol%    N<sub>2</sub> 15-17 mol%    CH<sub>4</sub> 5-7 mol%

## Results

- Example of one fluid inclusion from Panasqueira, Portugal: effect on CO<sub>2</sub>, CH<sub>4</sub> & N<sub>2</sub> peak area ratios
- Similar observations in other inclusions (CO<sub>2</sub> – N<sub>2</sub>, CH<sub>4</sub> – CO<sub>2</sub>)
- Alternating max and min peak area ratio every 45° from extinction position
- Variations up to 10 % of relative peak area
- “True” value supposed to be at extinction by analogy with inclusions in the NaCl – H<sub>2</sub>O system (Caumon et al., JRS 2015)
- Minor effect on the gas composition: gas phase dominated by CO<sub>2</sub>
- Final uncertainty on molar composition depends on cross section validity → Le et al., O6-3

## Conclusion

- Effect of host mineral birefringence on the Raman signal of gases as previously observed for water
- Amplitude of variation depending on the species & crystal orientation
- Low impact on the calculated gas composition when the gas phase is dominated by one species

The authors thank Marie-Christine Boiron for providing fluid inclusion samples and Maxime Dour for fluid inclusion pictures. This work was supported by INSU-CESSUR CNRS grant and Postgraduate International Exchange Funding from China University of Geosciences (Wuhan).