

in situ FTIR transmission experiments through catalytic pellets under CO₂-CH₄ plasma exposure

C.A. Garcia Soto^{1,2*}, E. Baratte¹, V.I. Parvulescu², O. Guitella¹

¹Laboratoire de Physique de Plasmas, École Polytechnique, CNRS, Sorbonne Université, Palaiseau, France

²Department of Organic Chemistry, Biochemistry and Catalysis, University of Bucharest, Bucharest, Romania

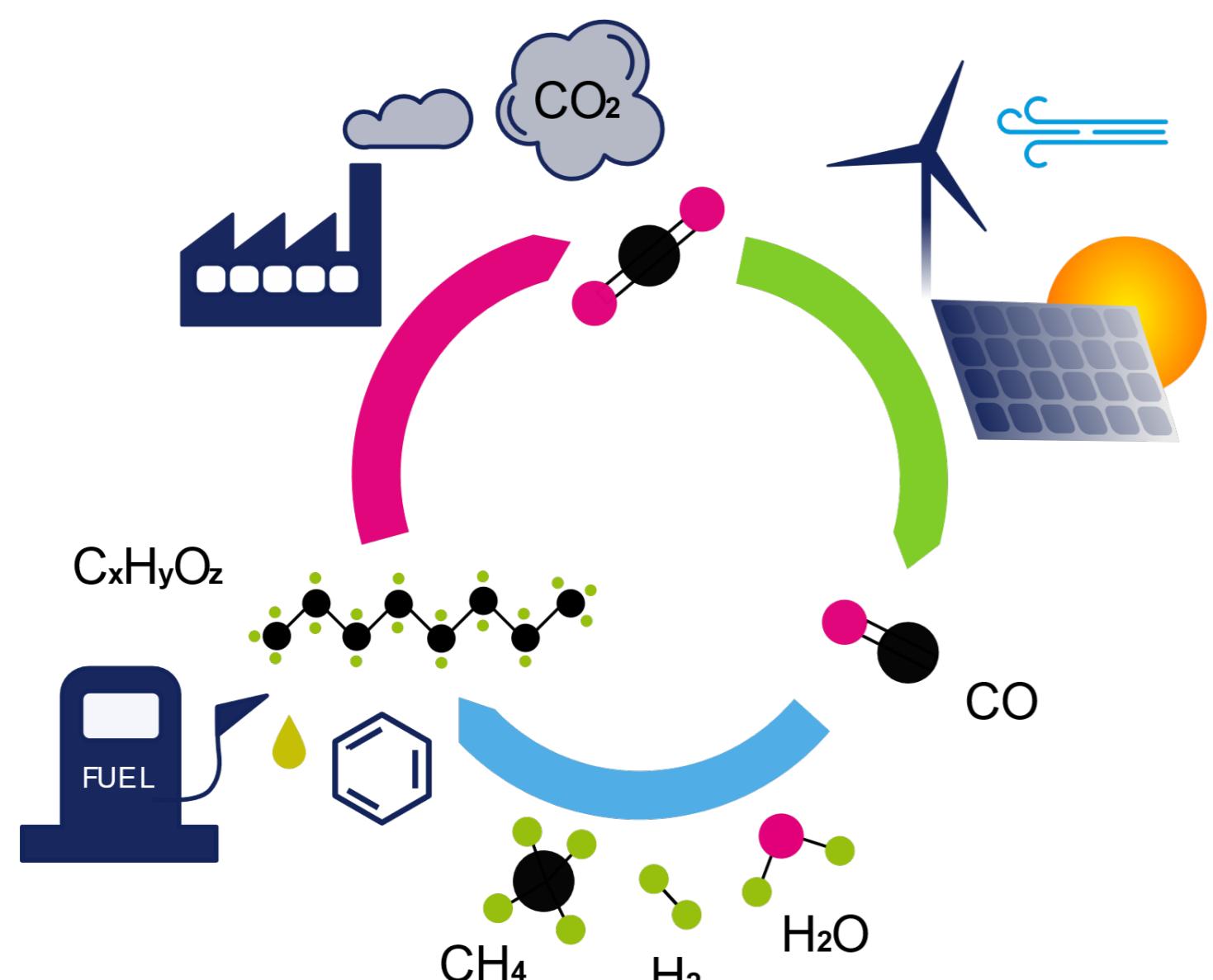


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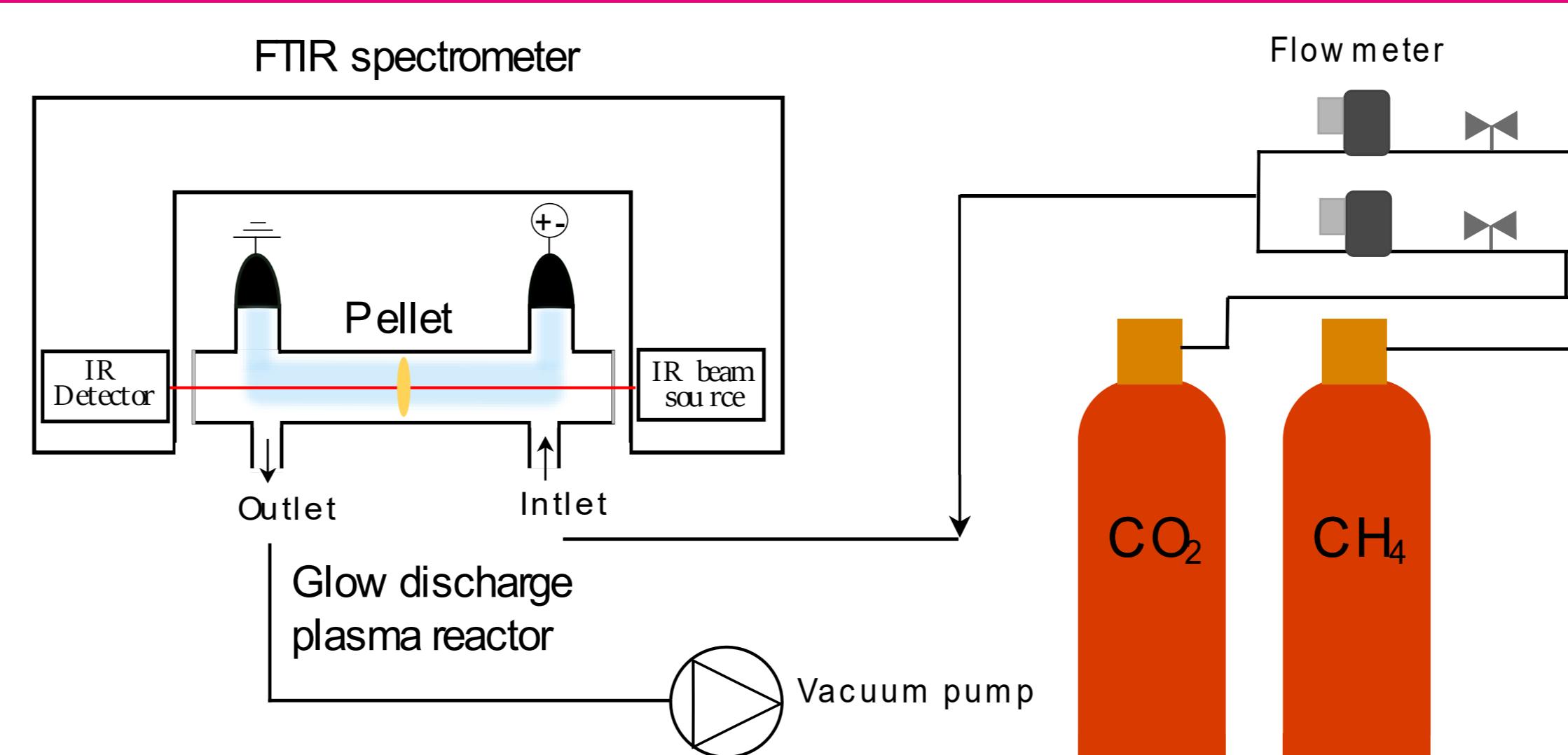
*Contact e-mail: carolina.garcia-soto@lpp.polytechnique.fr

Using Plasma-Catalysis for CO₂ recycling

Climate change caused by greenhouse gas emissions encourage the closing of the carbon cycle which can be achieved by converting CO₂ into platform molecules or short hydrocarbons. The use of **non-thermal plasmas** can promote the asymmetrical stretching vibration of CO for bond breakage. The presence of a catalyst could greatly improve the conversion and selectivity. The complexity of the **interaction of plasma with a surface** brings the necessity to study the underlying mechanisms occurring on the catalyst as a function of time and under different conditions.^[1,2]

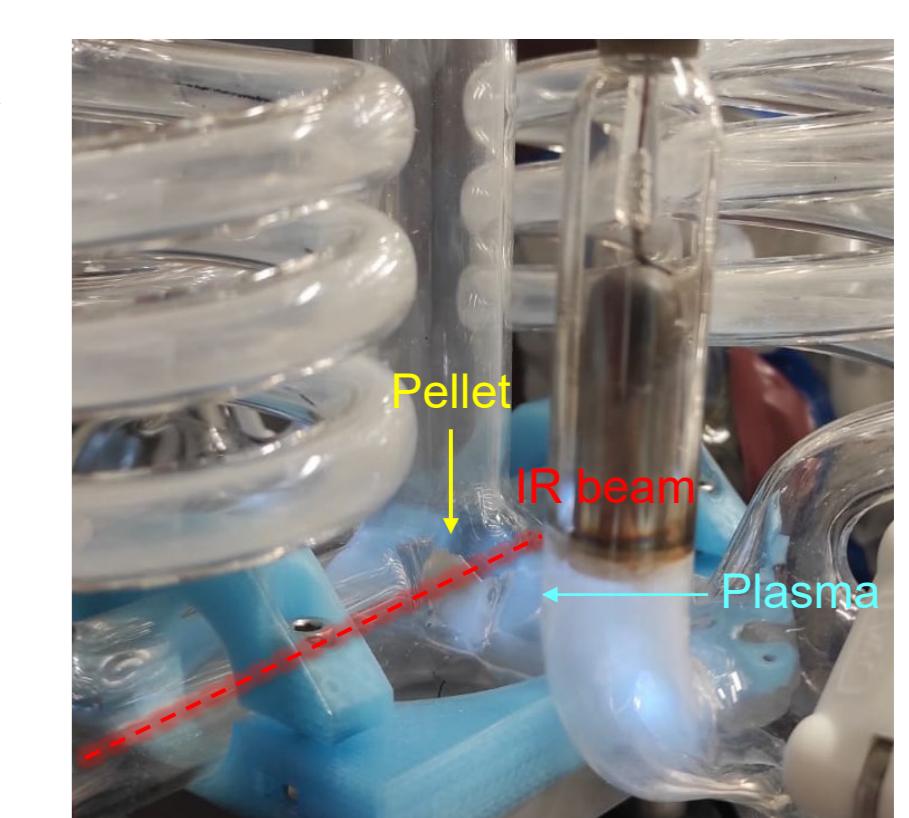
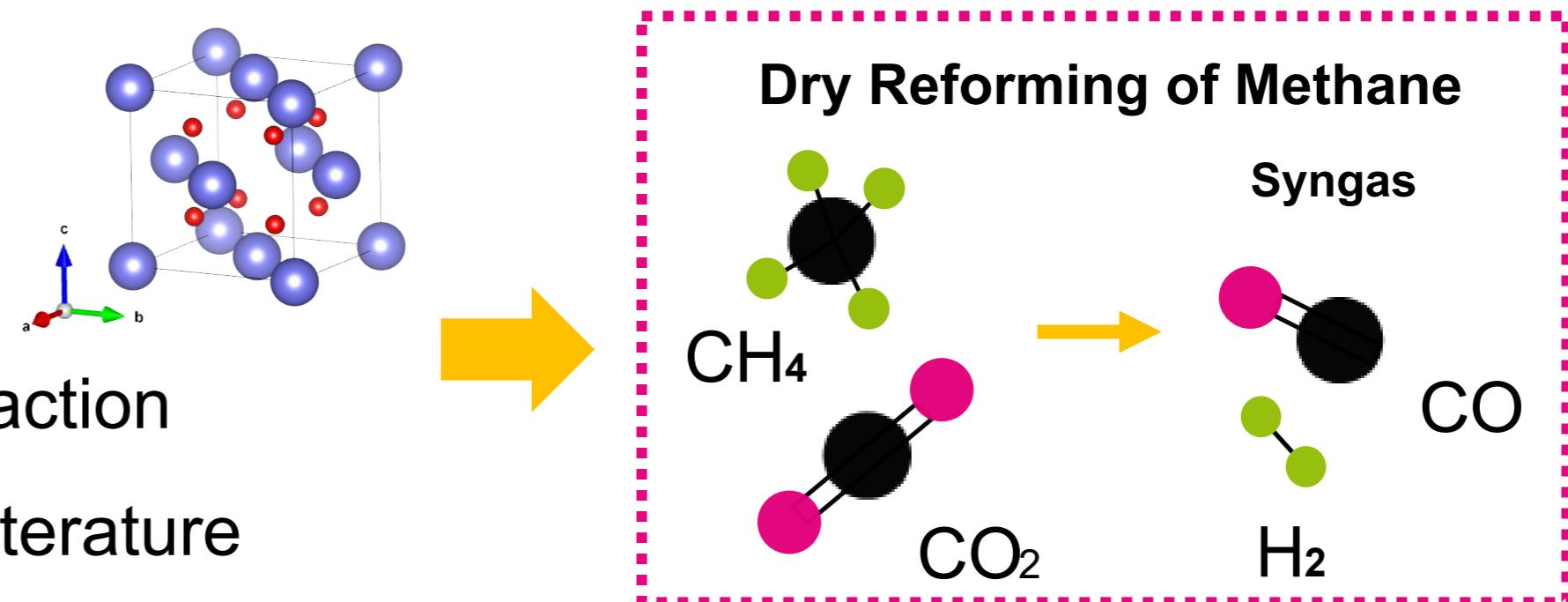


in situ FTIR transmission to study DC glow discharge plasmas

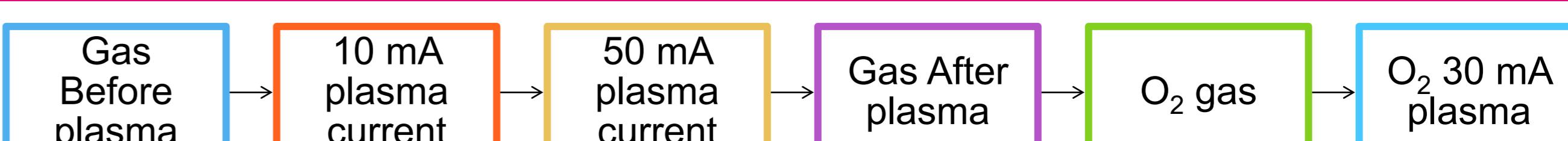


CeO₂ is known for activating CO₂ in mild conditions

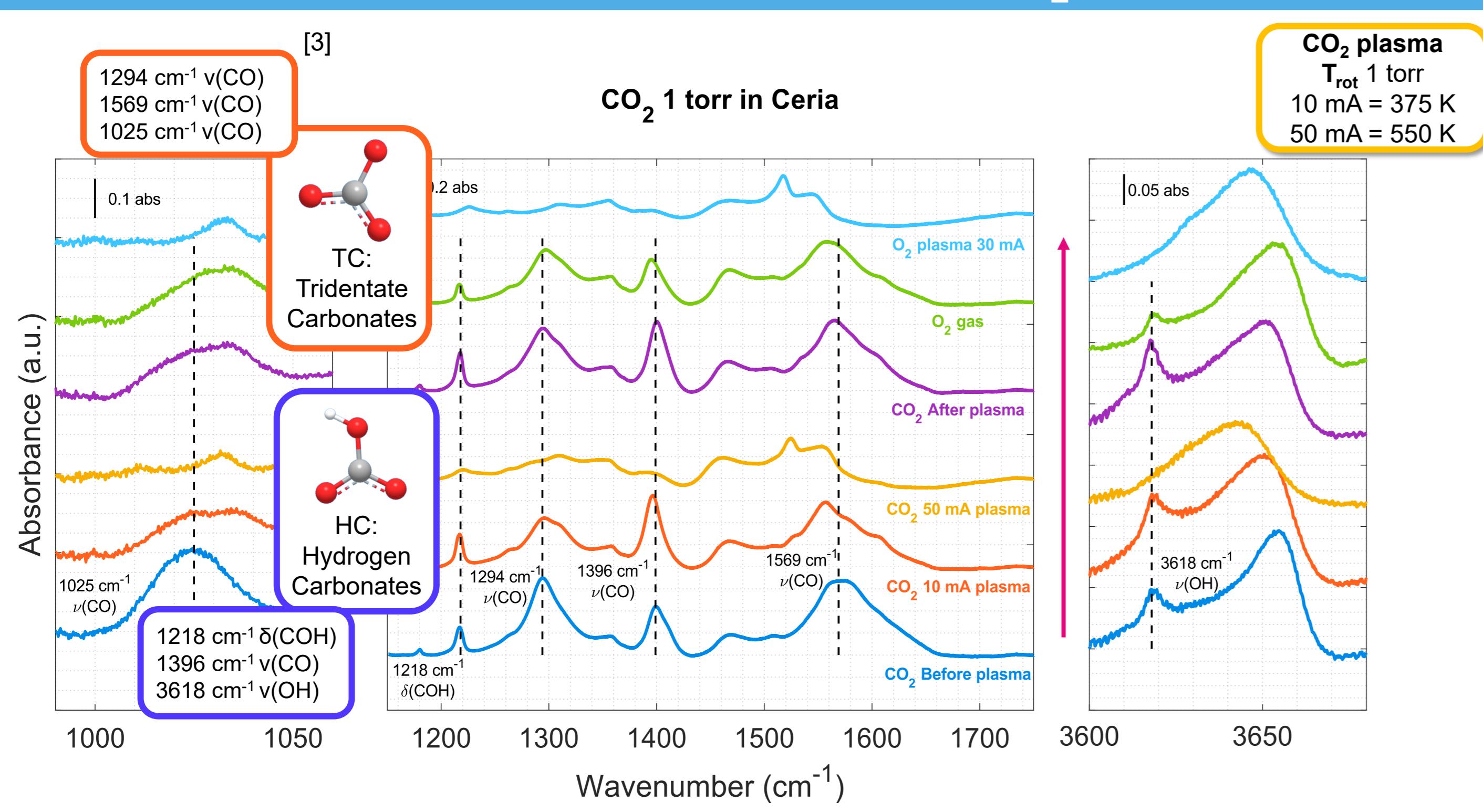
- Oxygen mobility
- Redox properties
- Metal – support interaction
- Info available in the literature



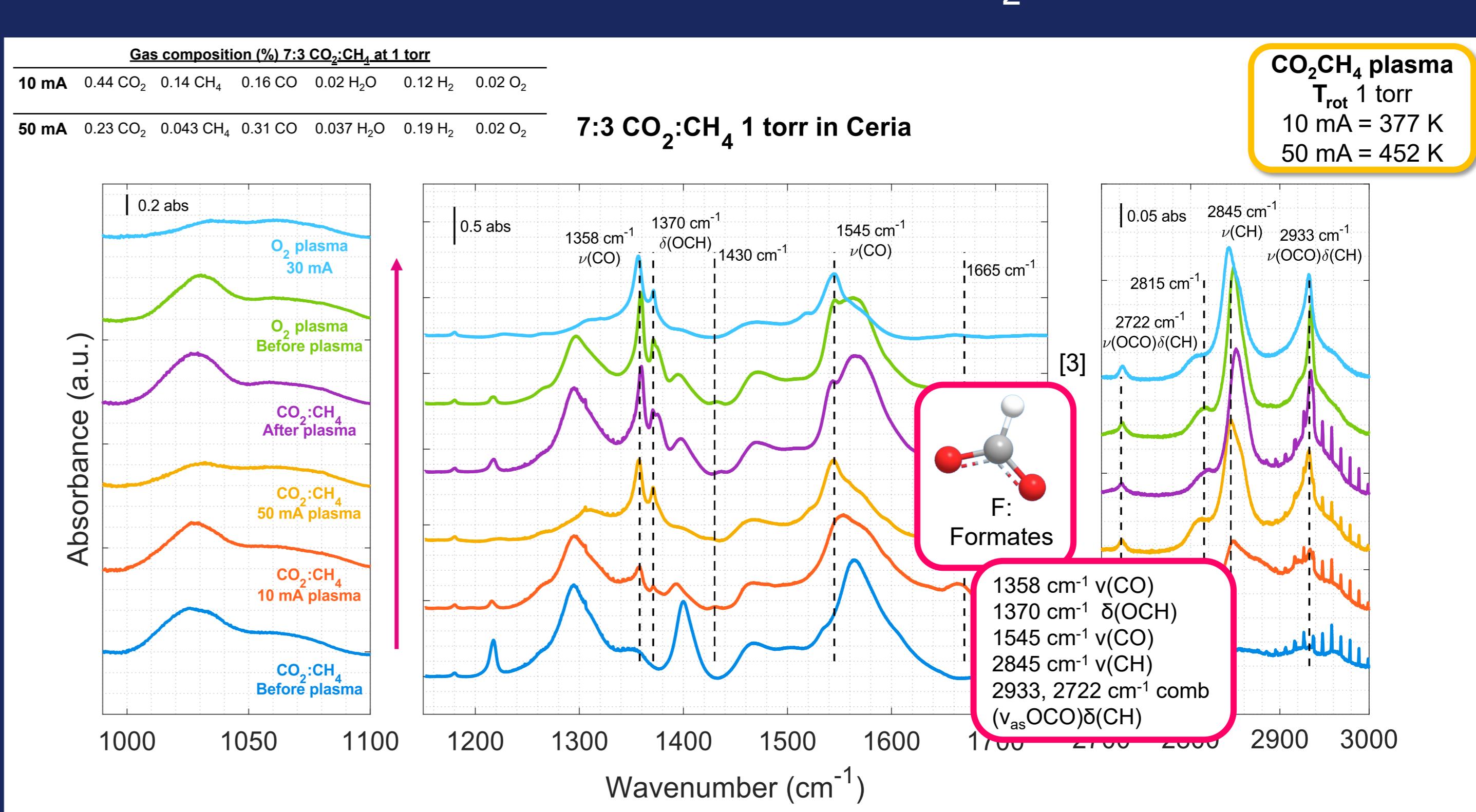
Sequence of steps, 10 min each



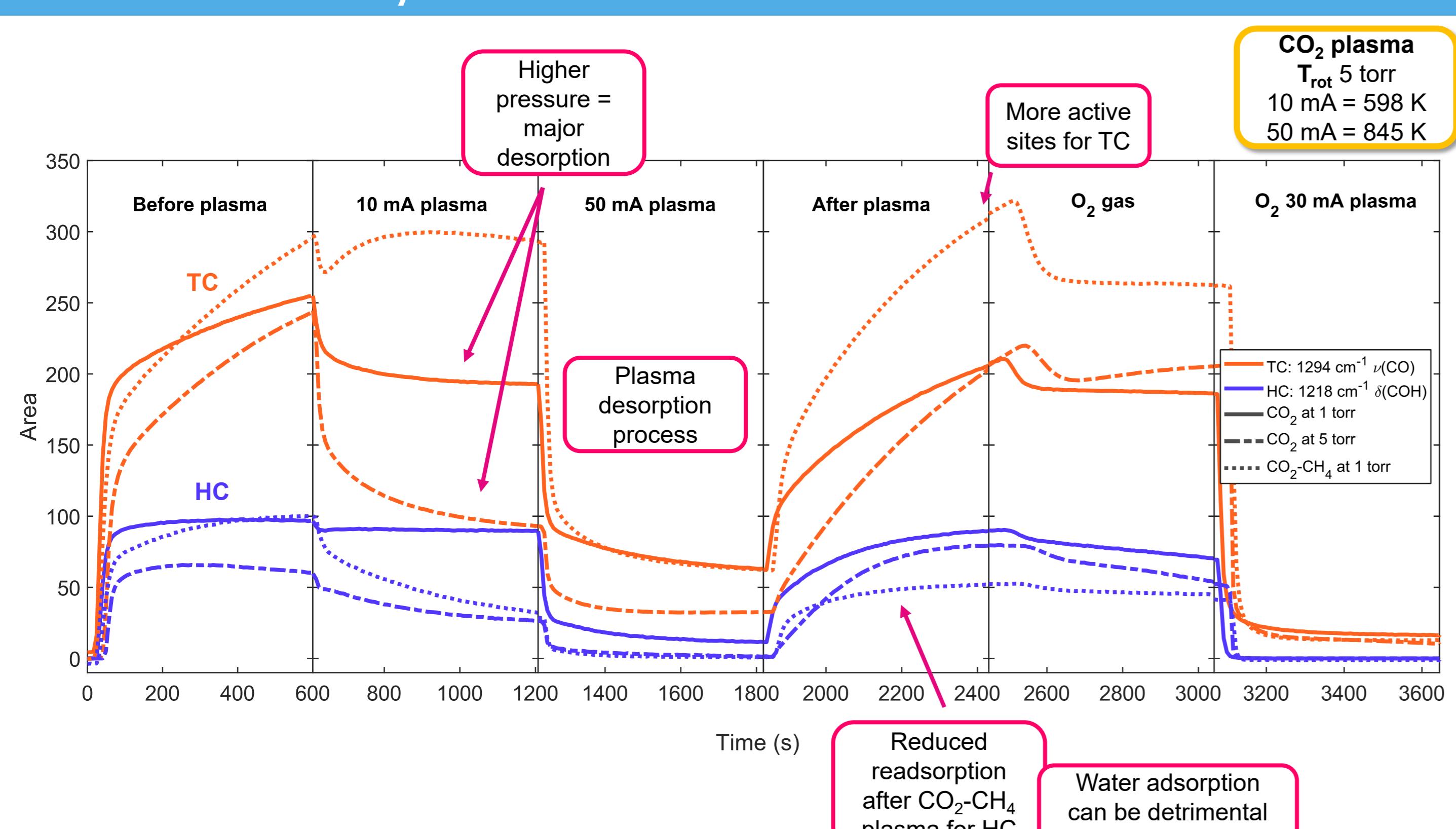
Carbonates are the main species by CO₂ adsorption...



CO₂-CH₄ plasmas promote formate species on the surface of CeO₂

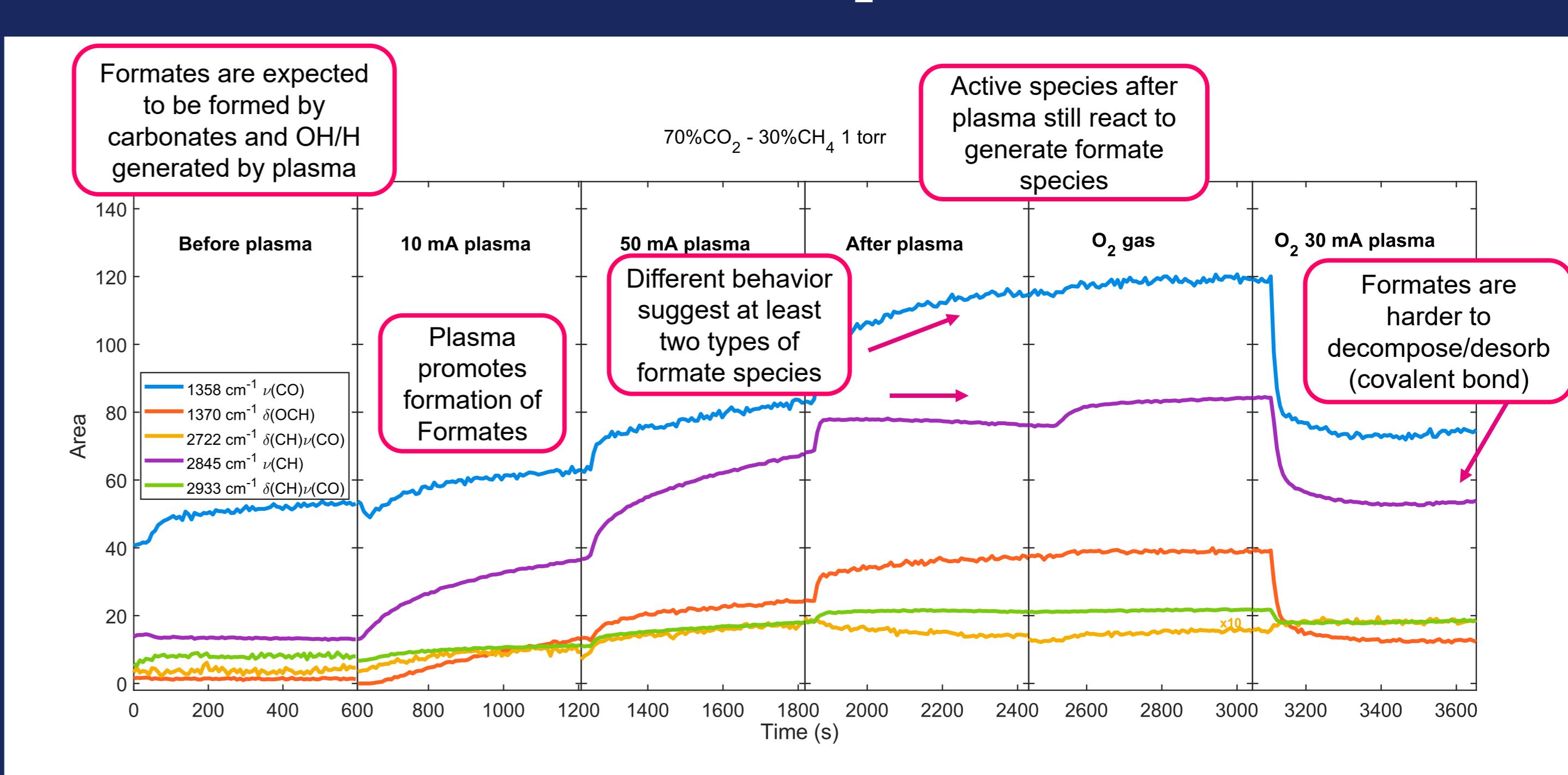


... and they can be followed as a function of time

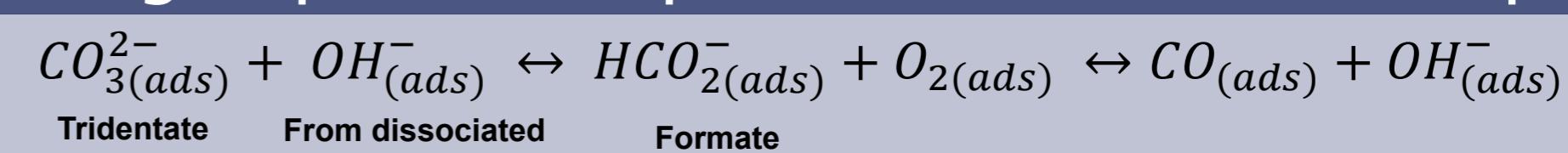


The addition of CH₄ to the mixture can change the adsorption of carbonates

Formates are known as surface intermediates for CO and H₂ release



TC and OH groups are the precursors of Formates species



References:

- [1] R. Vakili 2020 *Appl. Catal. B Environ.* **260**, pp. 118195
[2] Z. Sheng, H. H. Kim, S. Yao, and T. Nozaki, 2020 *Phys. Chem. Chem. Phys.* **22**, pp. 19350
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[5] Ferreira-Aparicio et al. 2000, *Appl. Catal. A Gen.* **202**, 183–196

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