

# Rapid-scan FTIR spectroscopy: the platform at LRS

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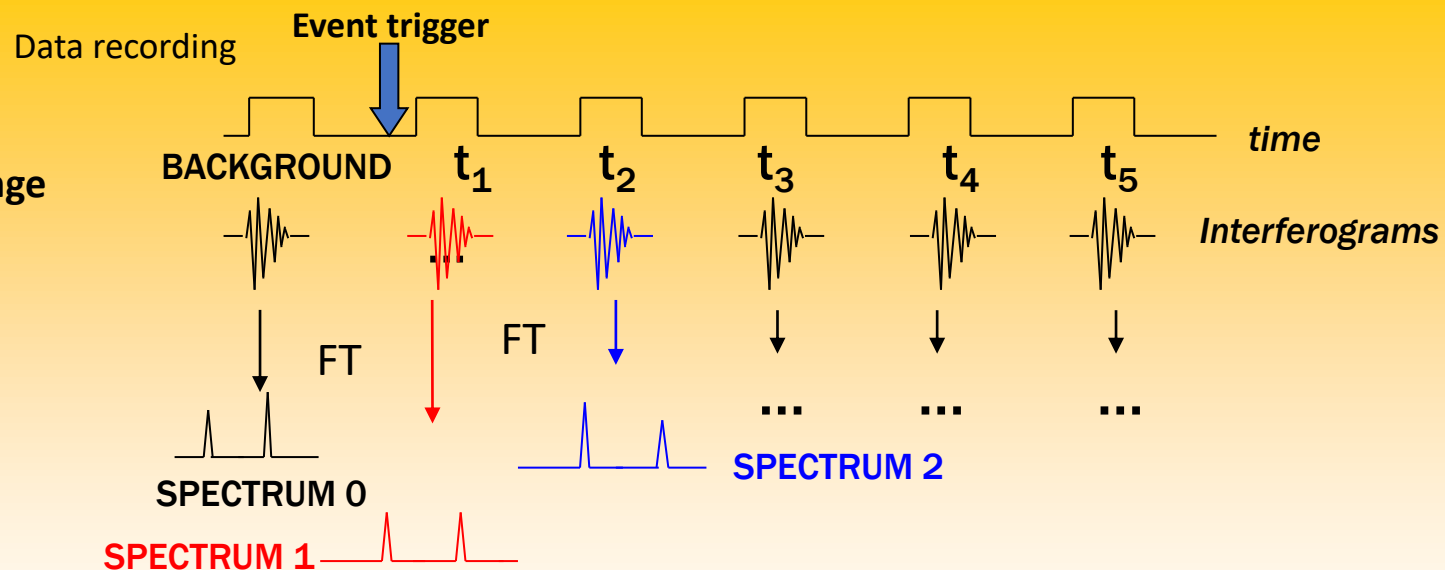


## RAPID-SCAN FTIR SPECTROSCOPY

time resolution  
depends on spectral range  
& spectral resolution :

Maximum 5-10 ms

Normally 200 ms – 10 s



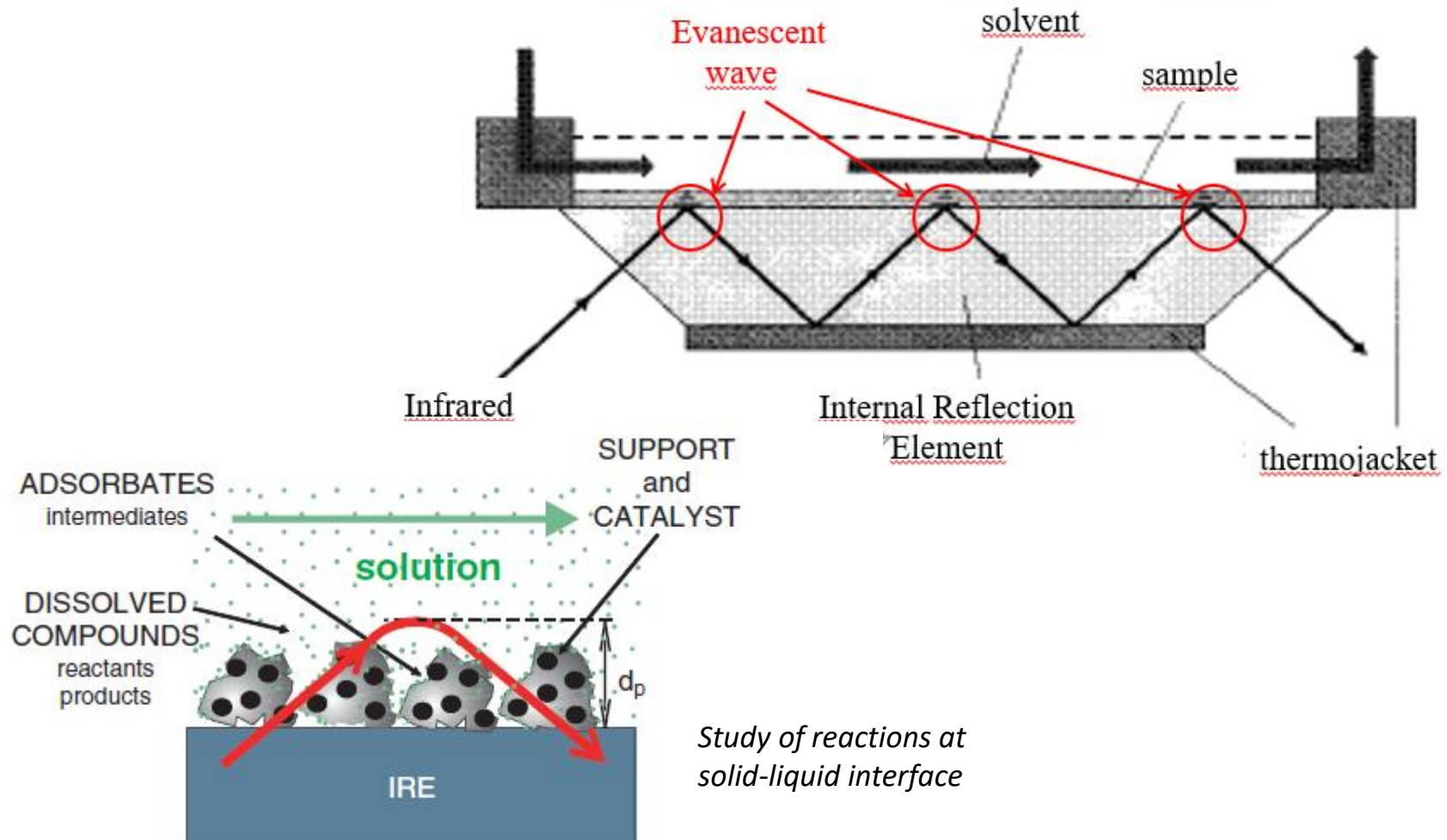
### Highly flexible instrument

- Spectral range 6000-500  $\text{cm}^{-1}$  (Mid-IR + a bit of Near-IR)
- Transmission
- ATR (Attenuated Total Reflectance) with 2 different crystals (one with T variable : 0-80°C)
- Time-res. light-induced IR difference spectra
- ATR under perfusion conditions (solid-liquid interface)
- Protocols for controlled hydration
- Spectra with high signal-to-noise ratio obtained in few minutes / few seconds

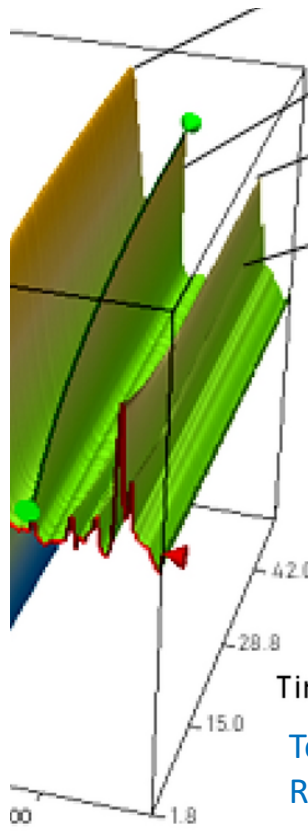
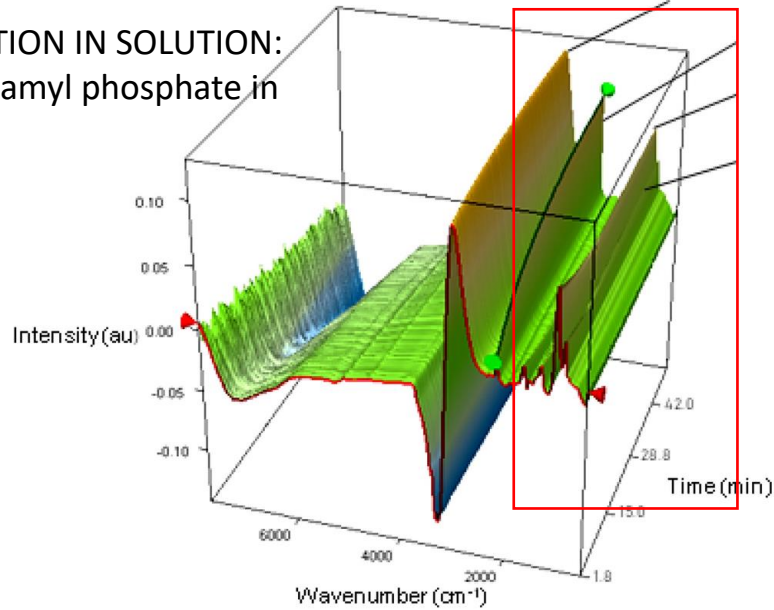
Systems studied until now

- structure/reactivity organic molecules on surfaces (mainly by ATR)
- reaction in solution (ATR)
- biomineralization processes
- photoinduced processes
- ...

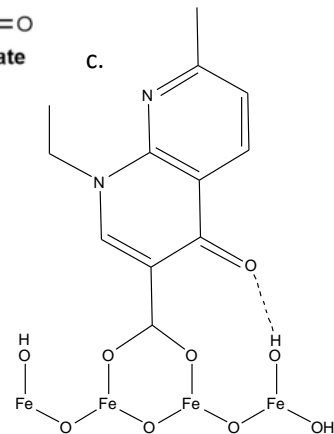
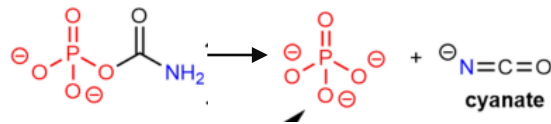
Chemical triggering: Attenuated Total Reflectance (ATR) technique



REACTION IN SOLUTION:  
Carboamyl phosphate in water

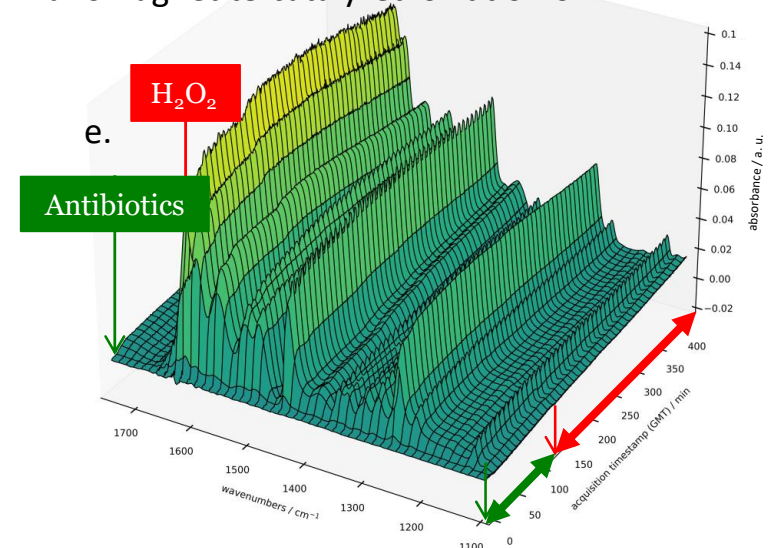


- 2170 cm<sup>-1</sup> (cyanate as. stretch.)
- 1125 cm<sup>-1</sup> (CP P=O stretch.)
- 1082 cm<sup>-1</sup> (P<sub>1</sub>P=O stretch.)
- 991 cm<sup>-1</sup> (MAP P-N stretch.)
- 977 cm<sup>-1</sup> (CP P-O-C stretch. out-of-phase)

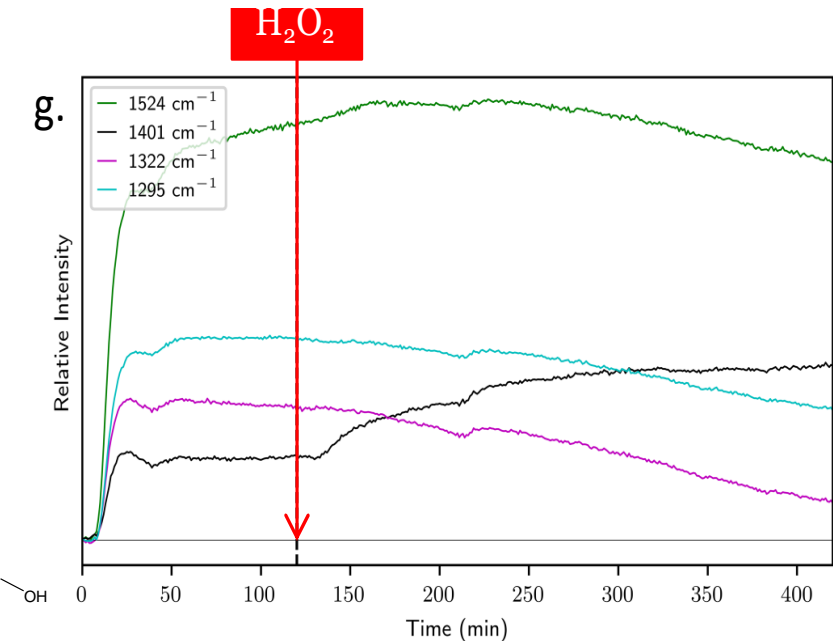


Ter Ovanessian et al. Scientific Report 2021

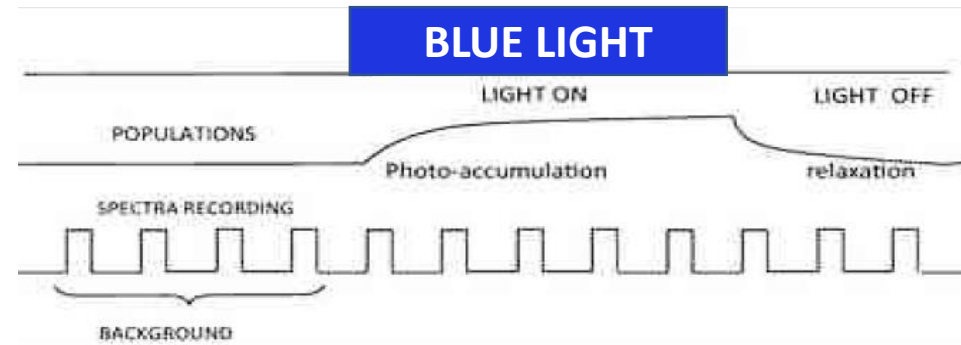
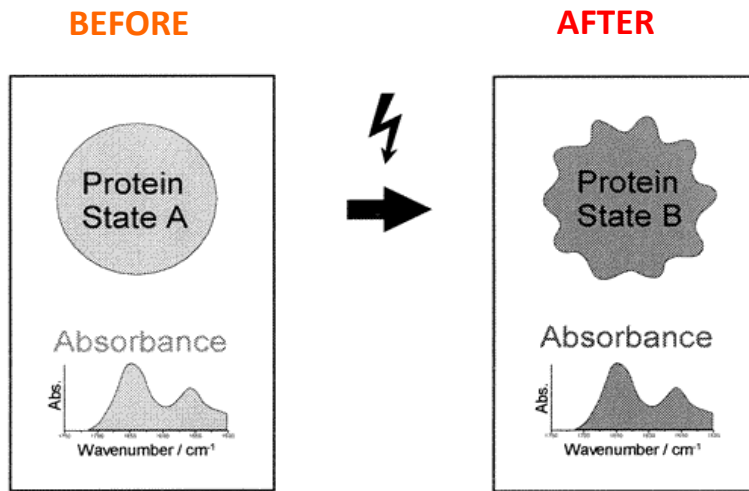
REACTION AT SOLID-LIQUID INTERFACE:  
Adsorption of NAL on nanomagnetite  
Nanomagnetite-catalyzed oxidation of NAL



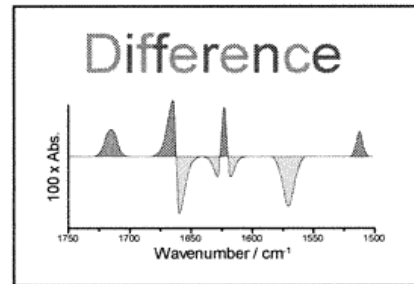
Schuh-Frantz et al in preparation



# PHOTOCHEMICAL REACTIONS: Time-res. difference FTIR on molecular mechanism of photoreceptors



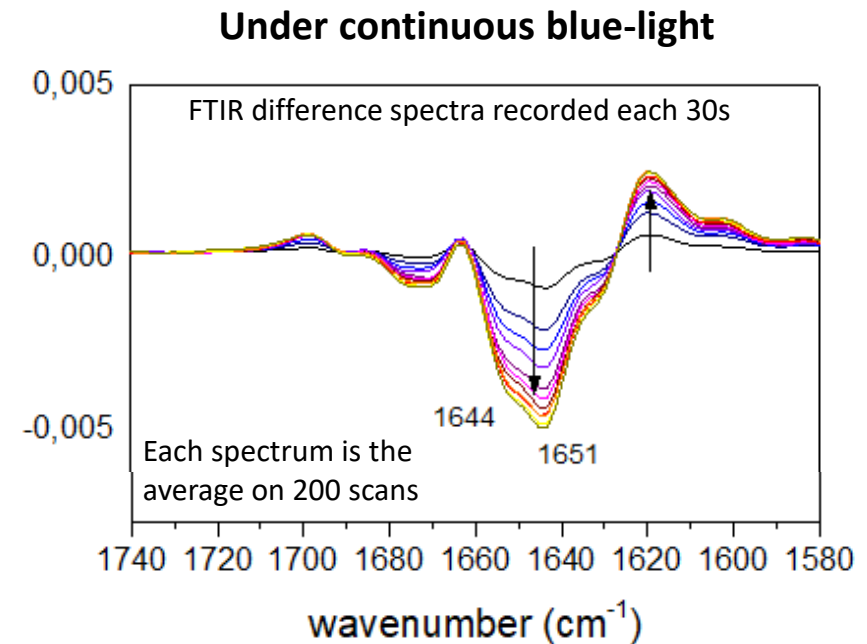
By subtracting the background from spectra recorded during illumination, time resolved FTIR difference spectra are obtained.



POSITIVE BANDS:  
FINAL STATE **OCP(red)**  
NEGATIVE BANDS:  
INITIAL STATE **OCP(orange)**

Only bands reflecting changes appear in the difference spectrum

Mezzetti et al J Phys Chem B 2019  
Leccese et al Photochem Photobiol sci 2023



## Acknowledgements

Jean-François Lambert  
Jean-Marc Kraftt  
Vincent Losinho  
Claude Jolivalt  
Xavier Carrier  
Guillaume Morin (IMPMC)

I hope I did not forget anyone....



*Thank you for your kind attention!*

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