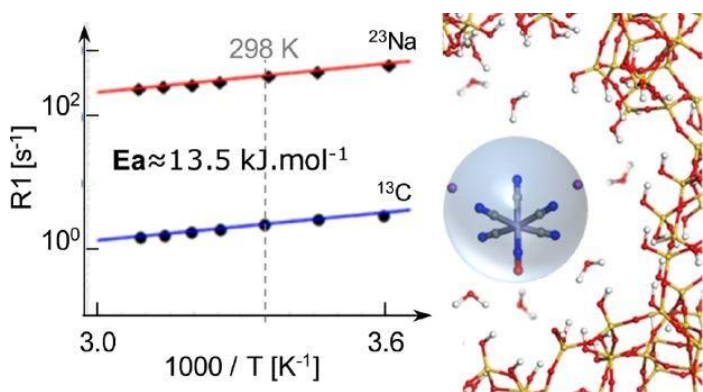


- Characterization of structure and dynamics in heterogeneous materials

I apply most of my research to the study of the confinement effect and host/guest interactions in different type of host matrices (SiO₂ type porous matrices, lipids, biological membranes), the understanding of these mechanisms being particularly important in the frame of the development of materials applied to Active Pharmaceutical Ingredient (API) vectorization or sensor devices.

Since the heterogeneity of hybrid materials generally provides structures being partially crystalline, amorphous, or even dynamic, their structural characterization is therefore a real challenge that we try to address in our laboratory.

Solid State NMR is particularly well adapted to this challenge since it can be applied to solids and liquids and does not require long distance order like for X-ray diffraction. We therefore apply NMR to the structural characterization of the host matrices as well as to the study of the confined APIs. By combining solution state and solid state NMR approaches we also study the dynamics of confined complexes and complement the results with information from total X ray diffraction (e.g. PDF analysis) in order to propose complete structural and dynamic models.



Top: Determination of the activation energy of the motion of a Sodium Nitroprusside complex confined in a SiO₂ porous matrix, by measuring temperature dependent R₁ longitudinal relaxation (Deligey F. et al. 2018). Right: Comparison of the dynamics of water molecules confined in two different bioglass matrices, using ¹H relaxometry and MAS NMR (Rjiba A. et al. 2021).

