Solid state NMR and diatoms: probing the interfaces

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SOLID STATE NMR AND DIATOMS: PROBING THE INTERFACES

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INTRODUCTION

Partnership :
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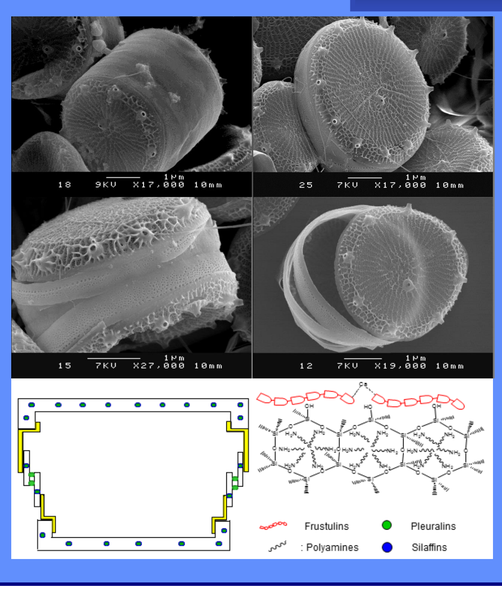
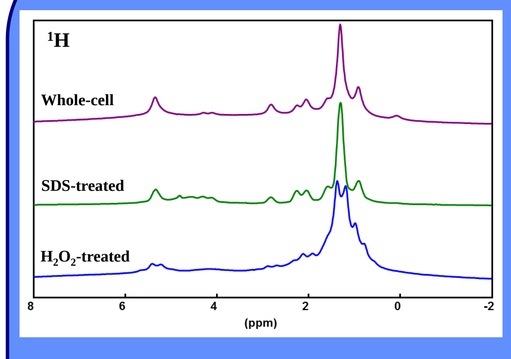
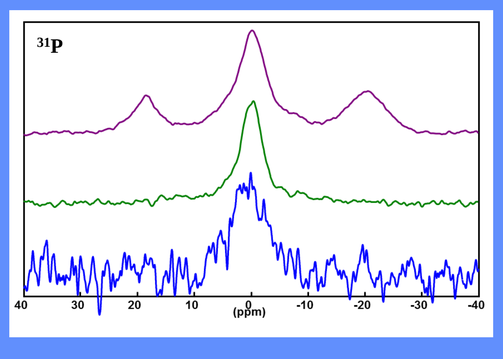


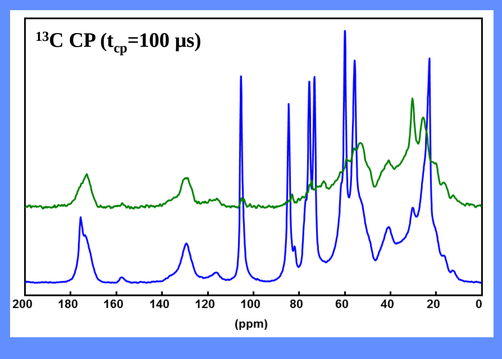
Gyromagnetic ratio |γ| ↘ — Relative sensibility ↘

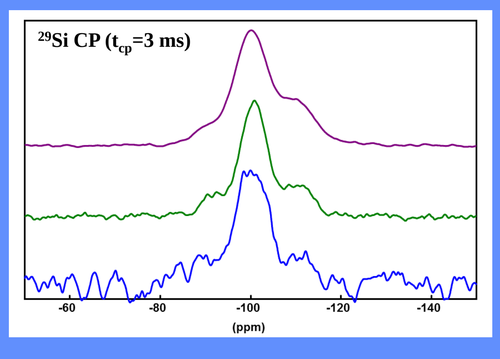
^{1}H 100% 26.75	^{31}P 100% 10.84	^{13}C 1.1% 6.73	^{29}Si 4.7% -5.32	^{15}N 0.36% -2.71
1/2	1/2	1/2	1/2	1/2

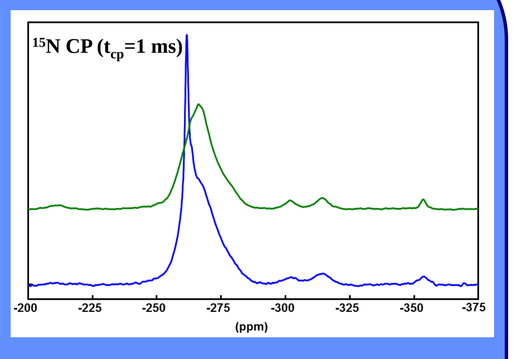
CHEMICAL TREATMENT







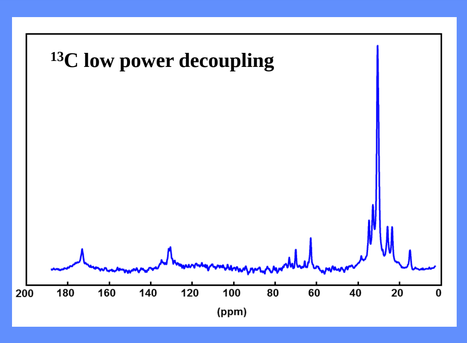


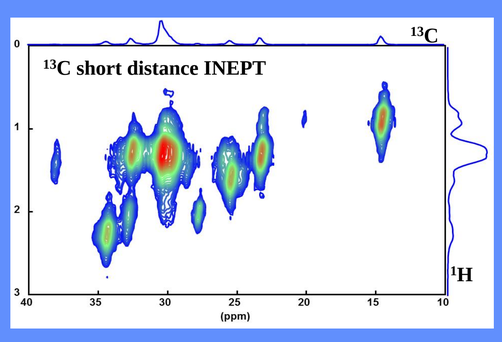


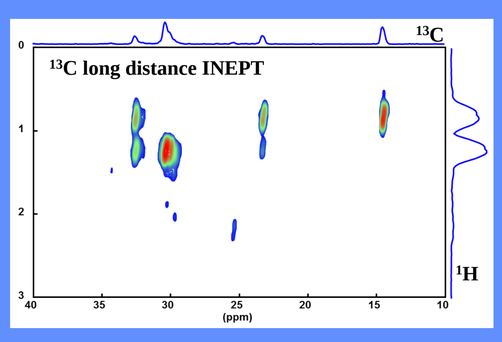
Whole-cell, SDS-treated and H_2O_2-treated samples were isotopically enriched with ^{29}Si, $^{13}C/^{29}Si/^{15}N$ and $^{13}C/^{15}N$, respectively. While SDS is used to clean the frustule, H_2O_2 treatment seems to be much more aggressive, probably leading to partial dissolution-recrystallization.

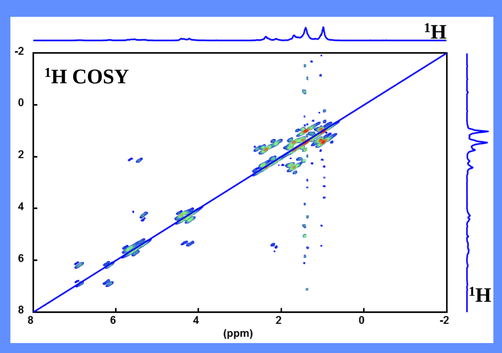
SDS-TREATED SAMPLE

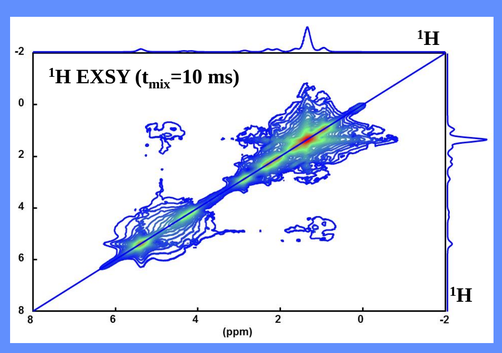
MOBILE SPECIES





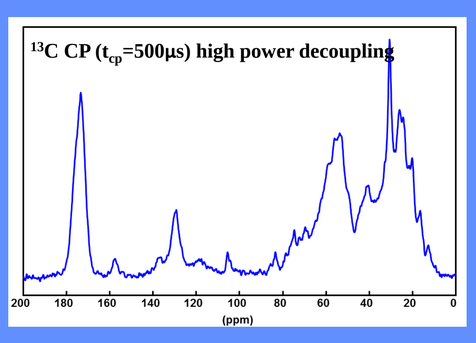


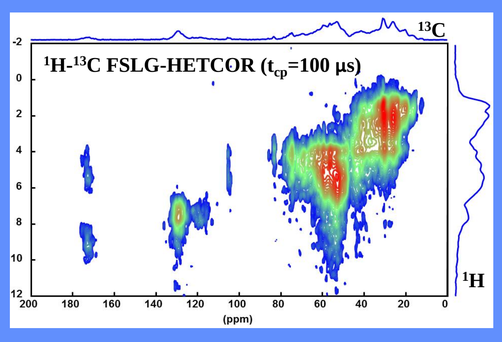


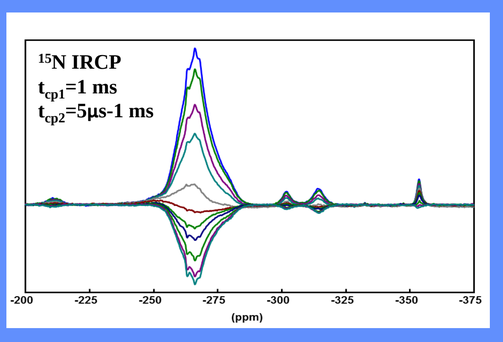


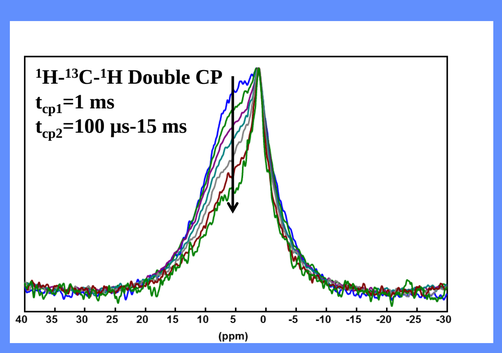
Liquid-state-inspired NMR experiments mainly highlight the most mobile species: unsaturated lipids. Nevertheless EXSY exp. shows spin diffusion between two broad protons regions.

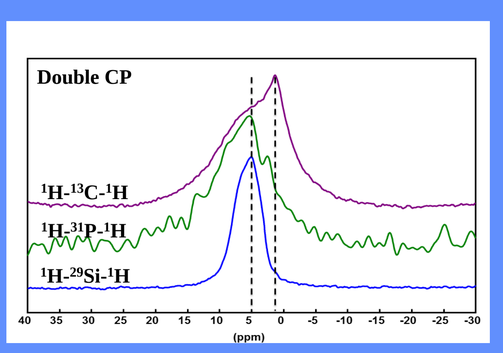
RIGID SPECIES











Solid-state NMR experiments allow to probe another part of the sample: the rigid one. Playing with the selected nuclei, spatial proximities can be assessed.

CONCLUSION AND REFERENCES

While a lot of work is still needed to fully understand diatoms frustule interface, solid-state NMR appears to be a powerful toolbox. Indeed, this technique is able to selectively probe either mobile or rigid species at a very local scale. Varying methods, species proximity can be checked and connectivity evaluated.

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