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Solid state NMR and diatoms: probing the interfaces

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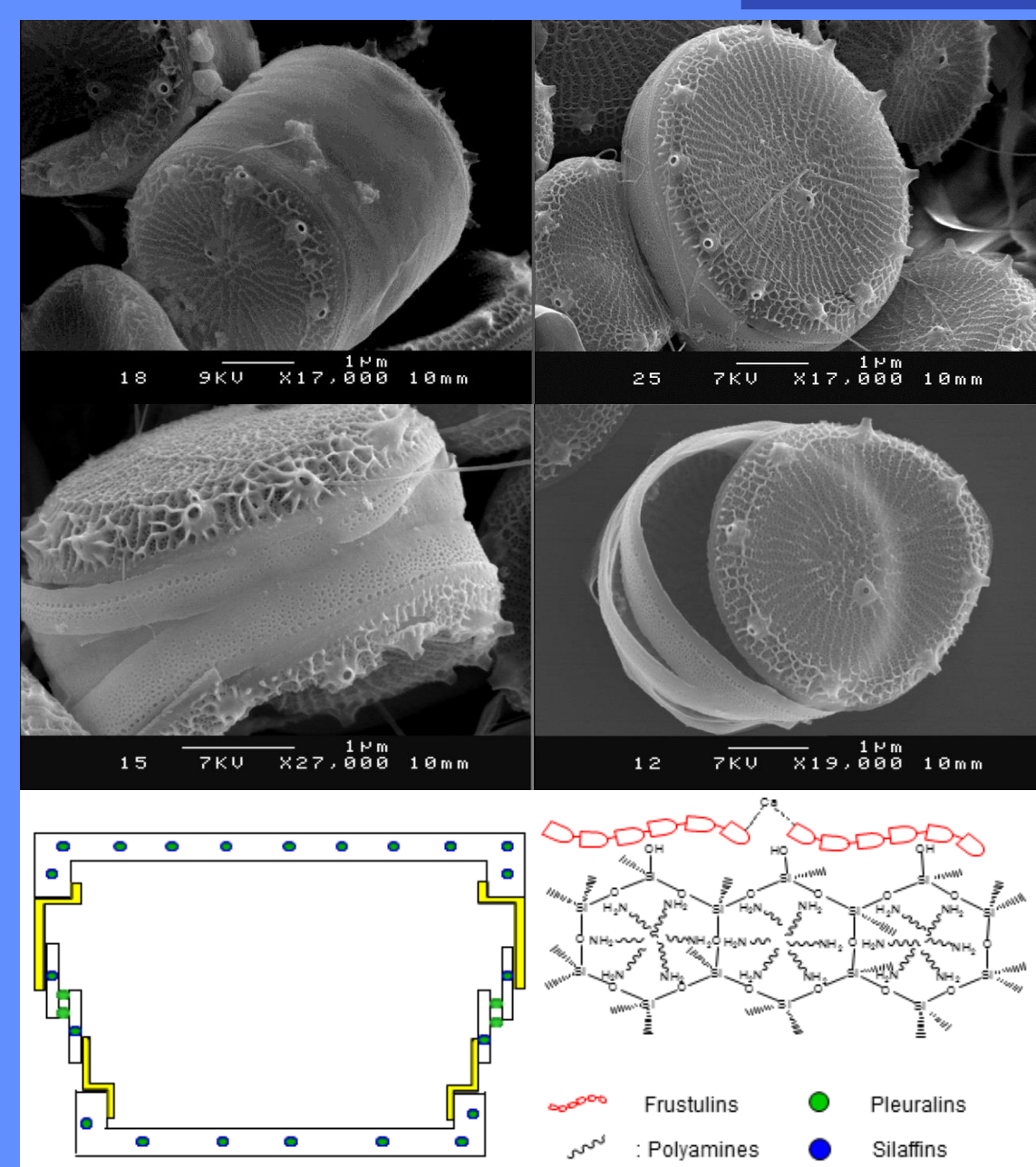


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INTRODUCTION

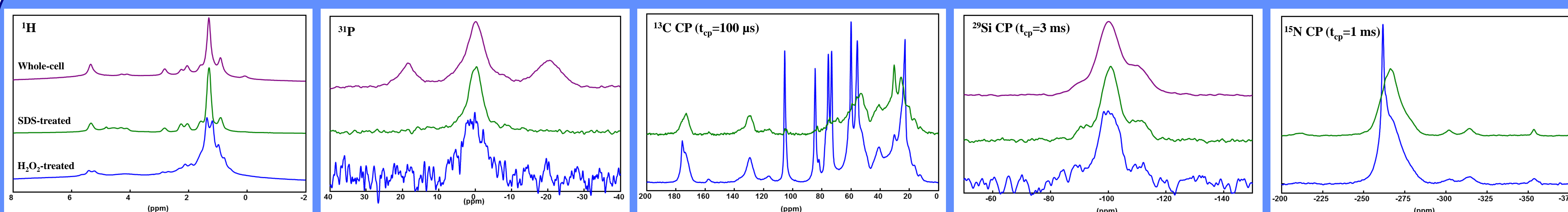


Partnership :
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Gyromagnetic ratio $ \gamma $		$\frac{\gamma}{\text{NA}}$		Relative sensitivity \searrow	
I	γ (10 ⁶)	γ (10 ⁶)	γ (10 ⁶)	γ (10 ⁶)	γ (10 ⁶)
¹ H	100%	100%	100%	100%	100%
³¹ P	100%	100%	100%	100%	100%
¹³ C	11%	11%	11%	11%	11%
²⁹ Si	4.7%	4.7%	4.7%	4.7%	4.7%
¹⁵ N	0.36%	0.36%	0.36%	0.36%	0.36%

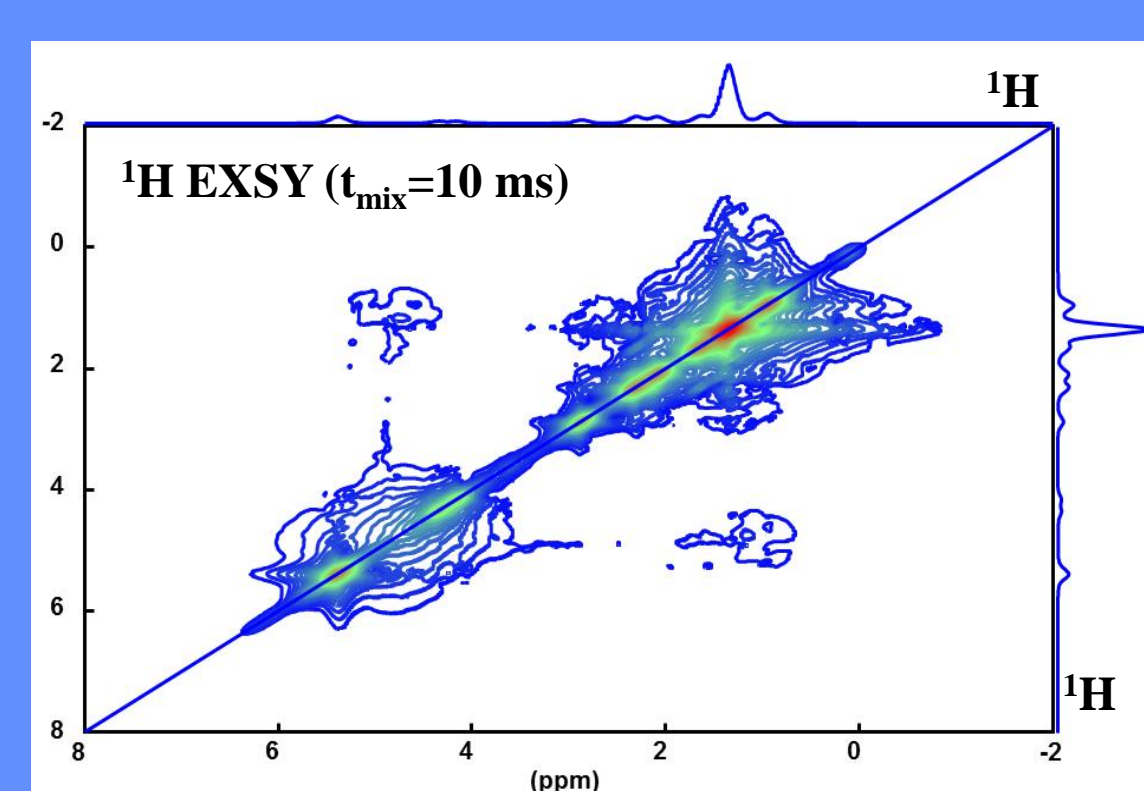
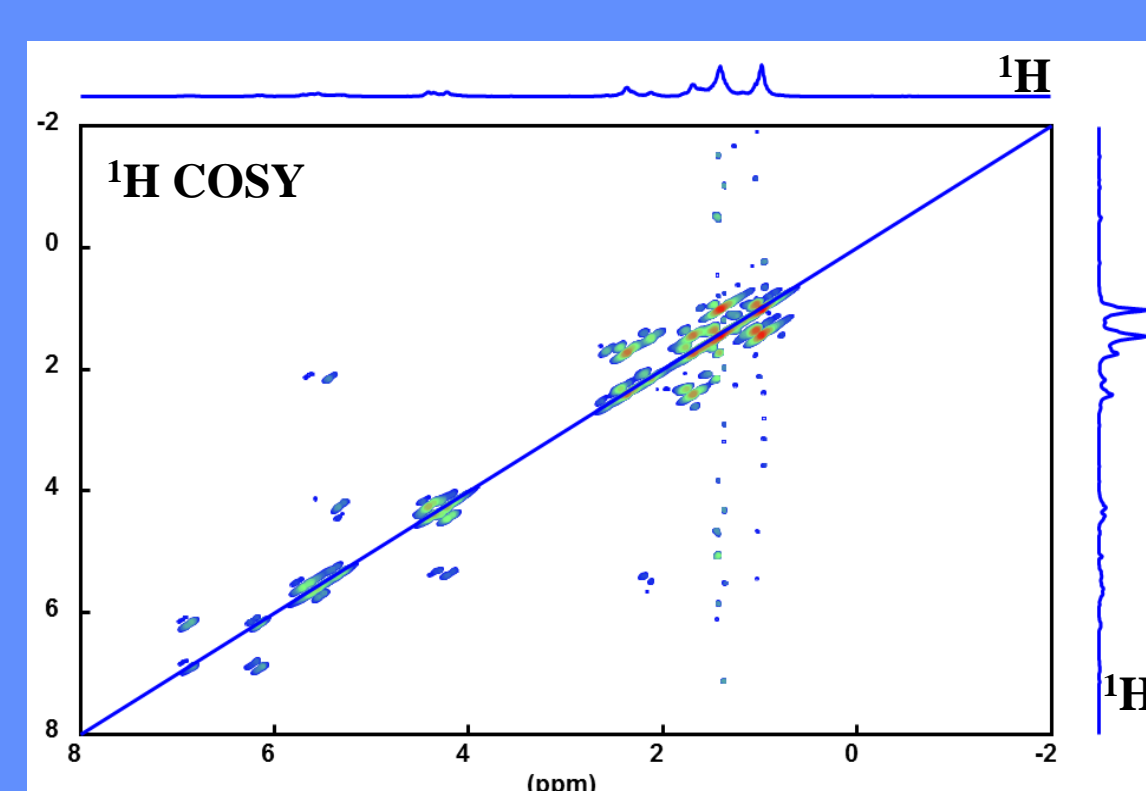
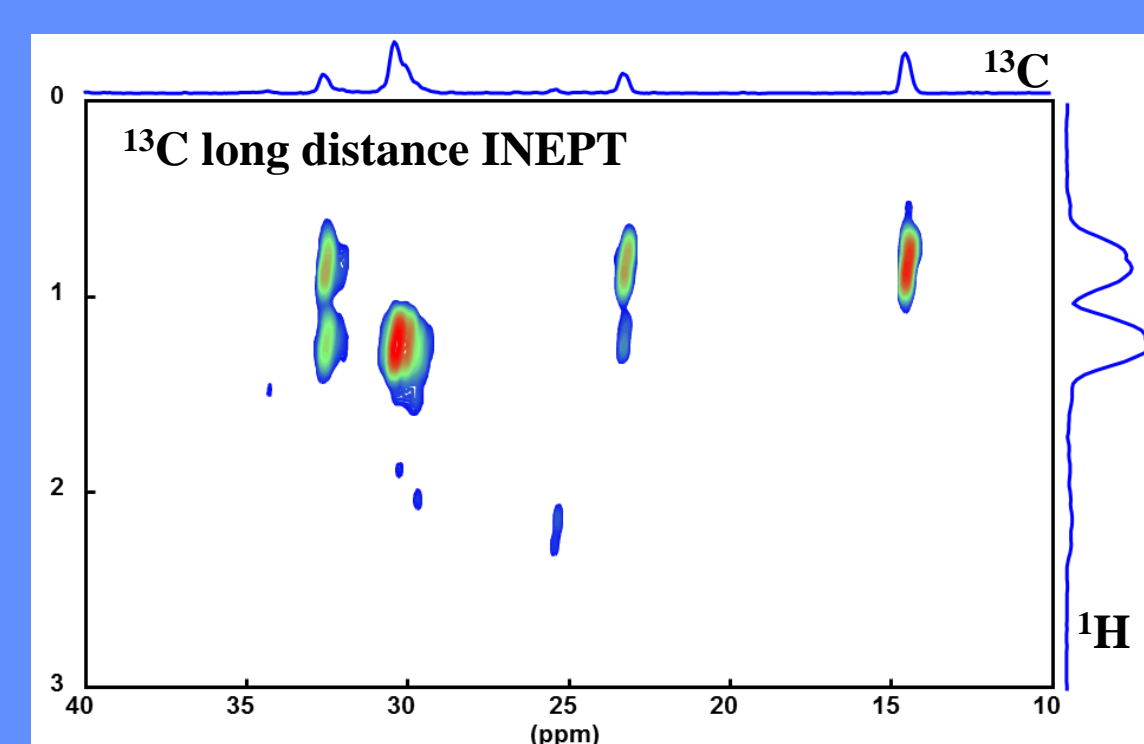
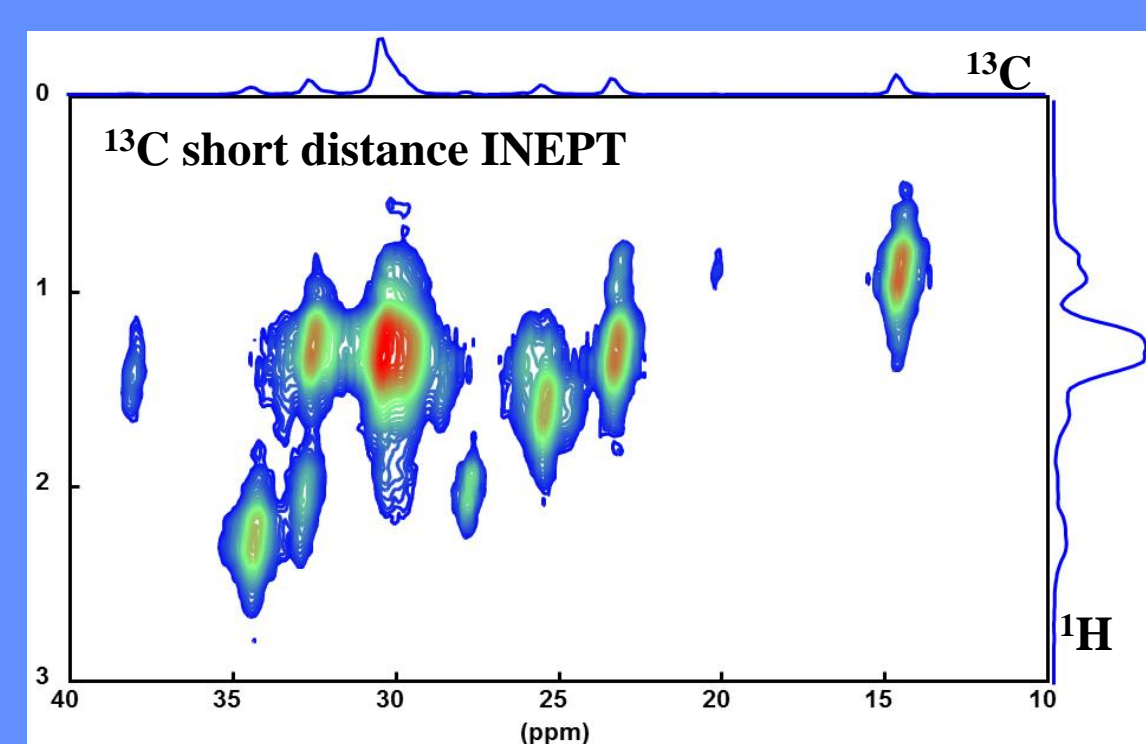
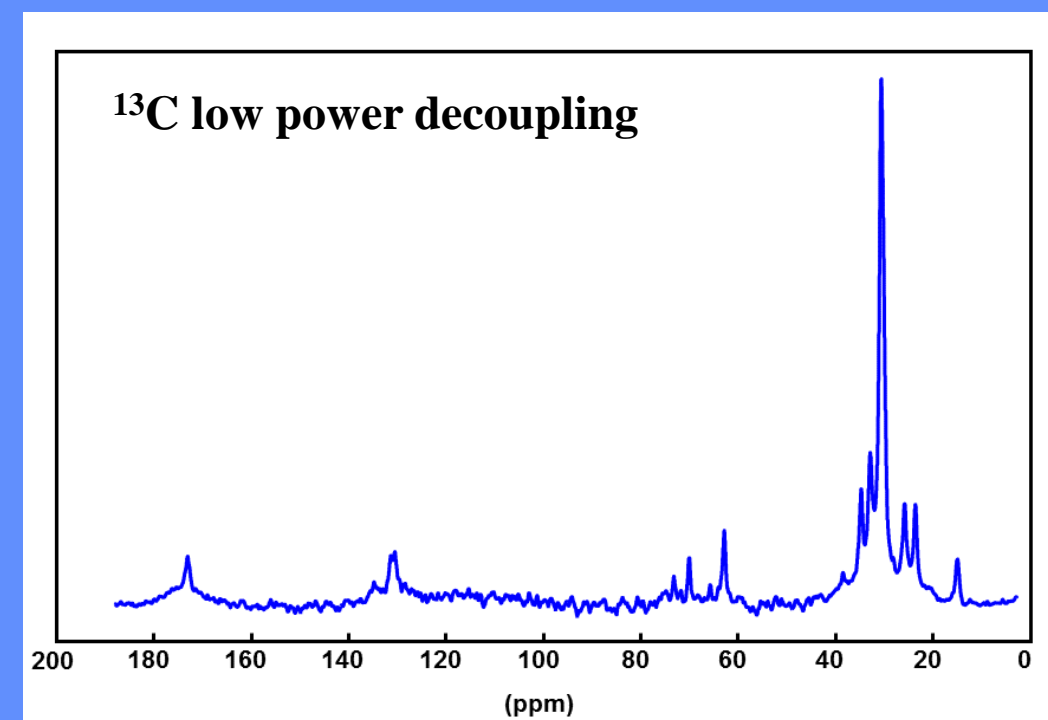
CHEMICAL TREATMENT



Whole-cell, SDS-treated and H₂O₂-treated samples were isotopically enriched with ²⁹Si, ¹³C/²⁹Si/¹⁵N and ¹³C/¹⁵N, respectively. While SDS is used to clean the frustule, H₂O₂ treatment seems to be much more aggressive, probably leading to partial dissolution-recrystallization.

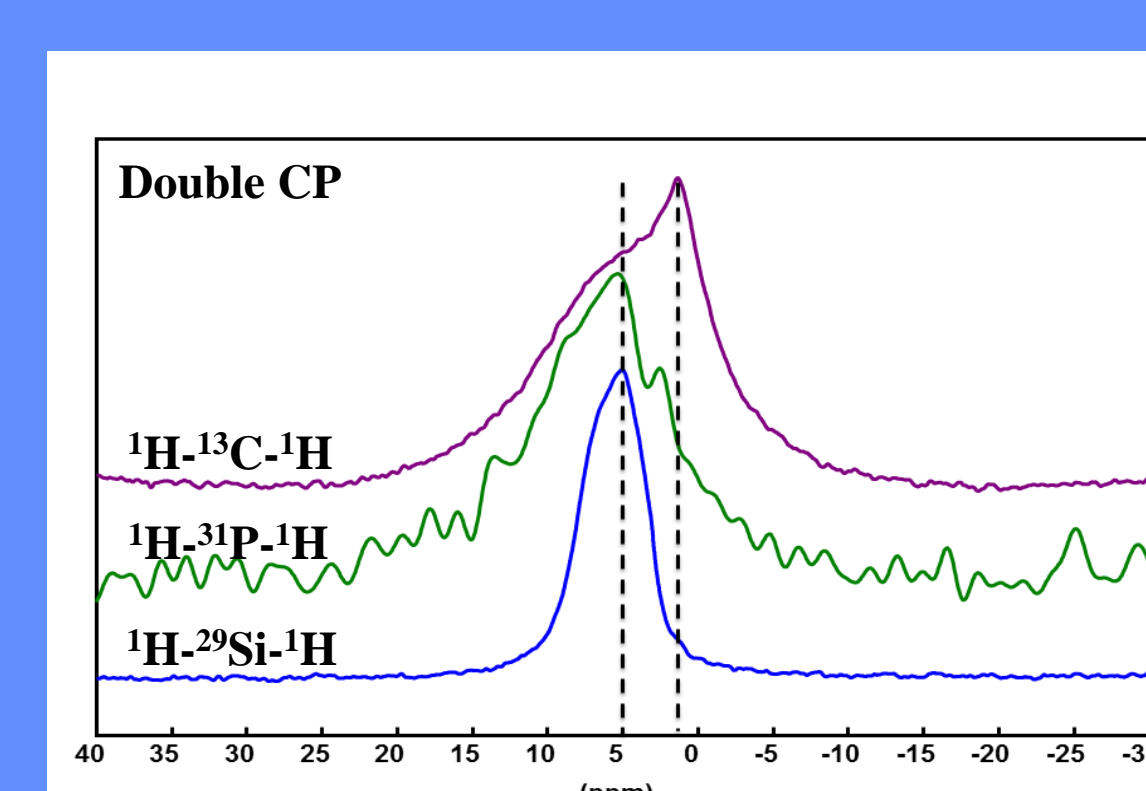
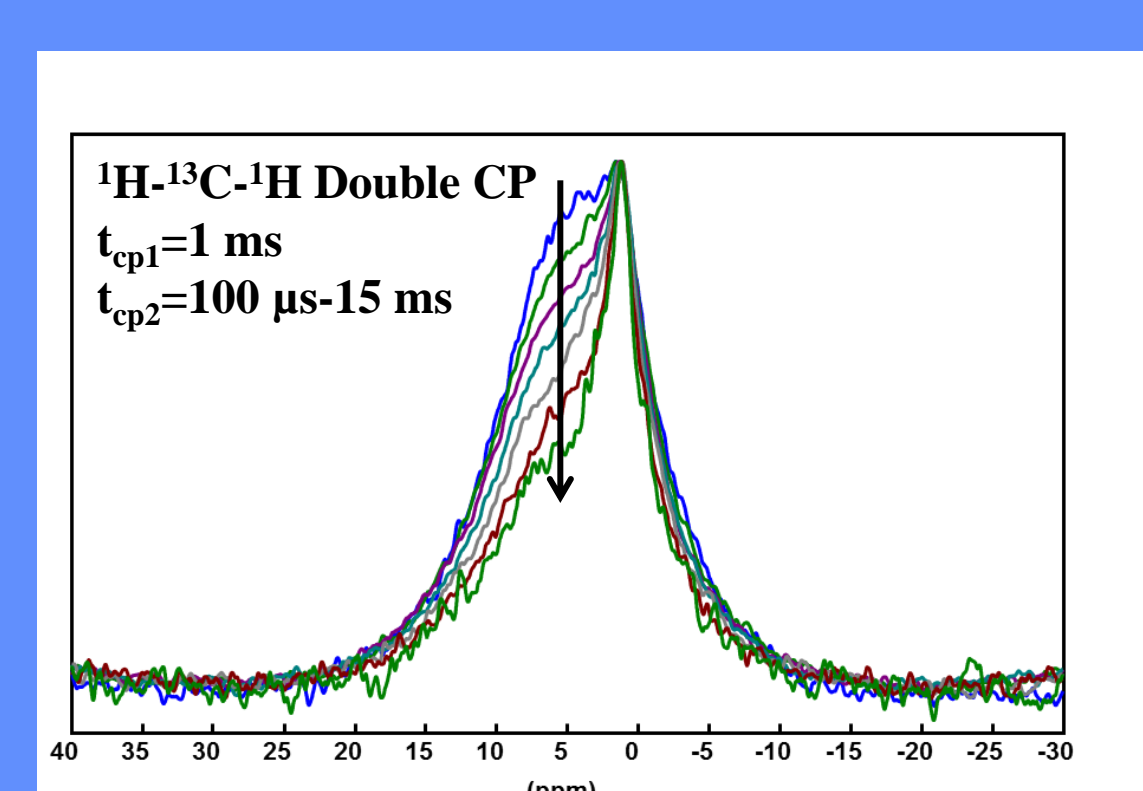
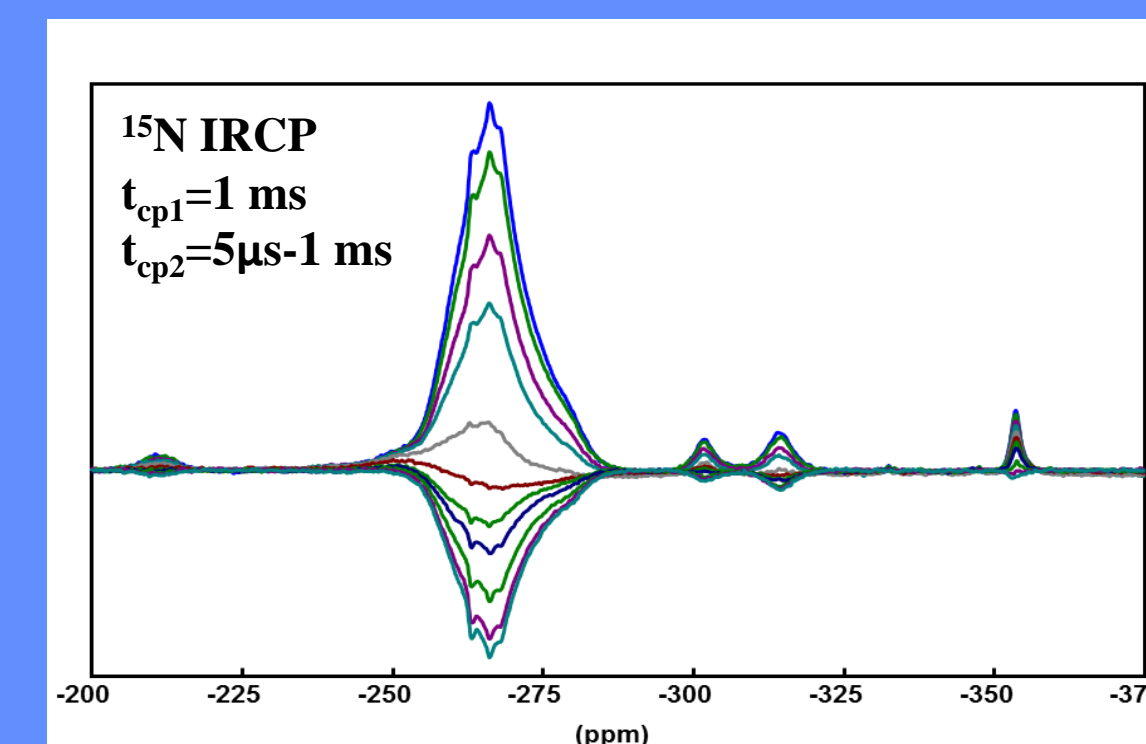
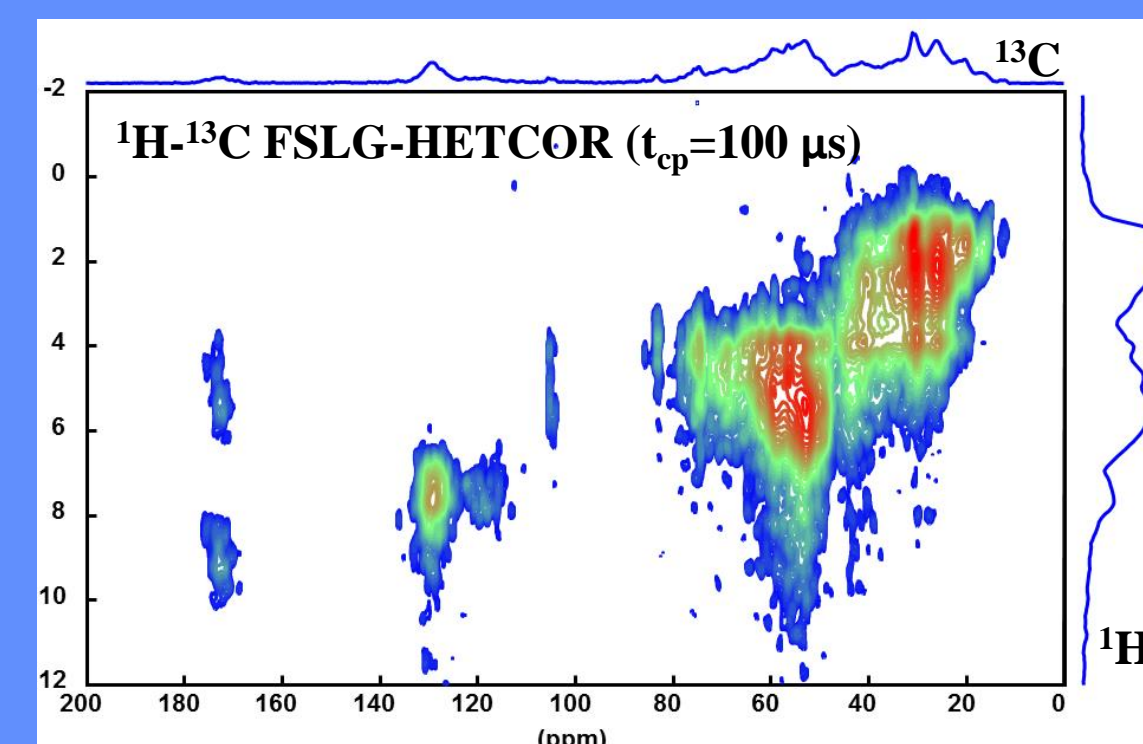
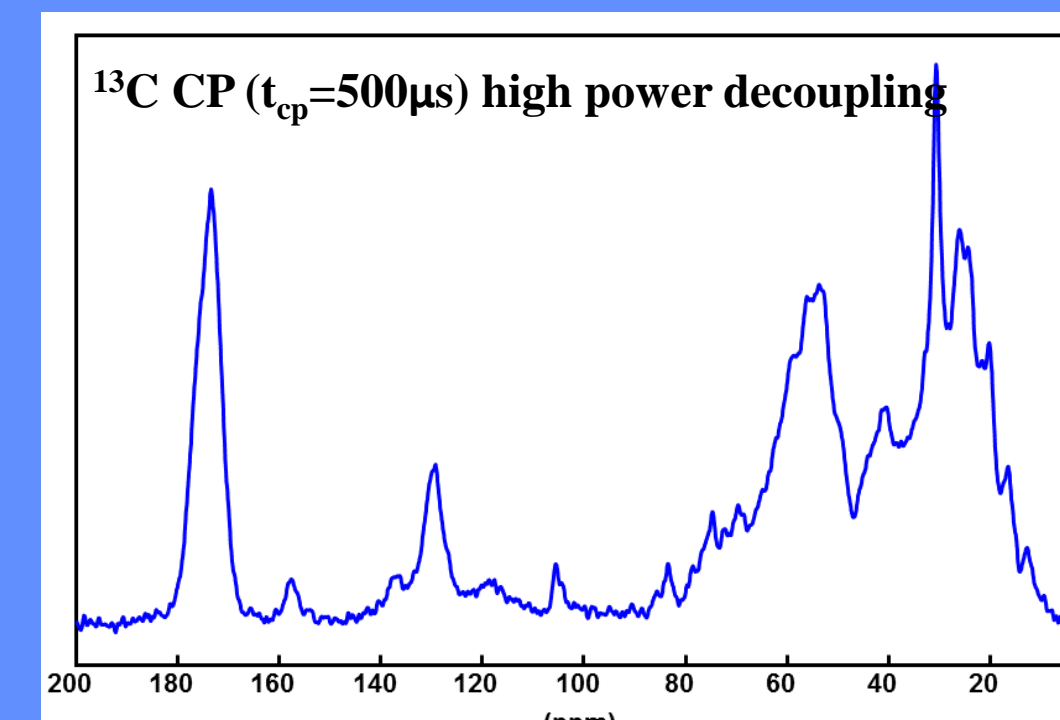
SDS-TREATED SAMPLE

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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