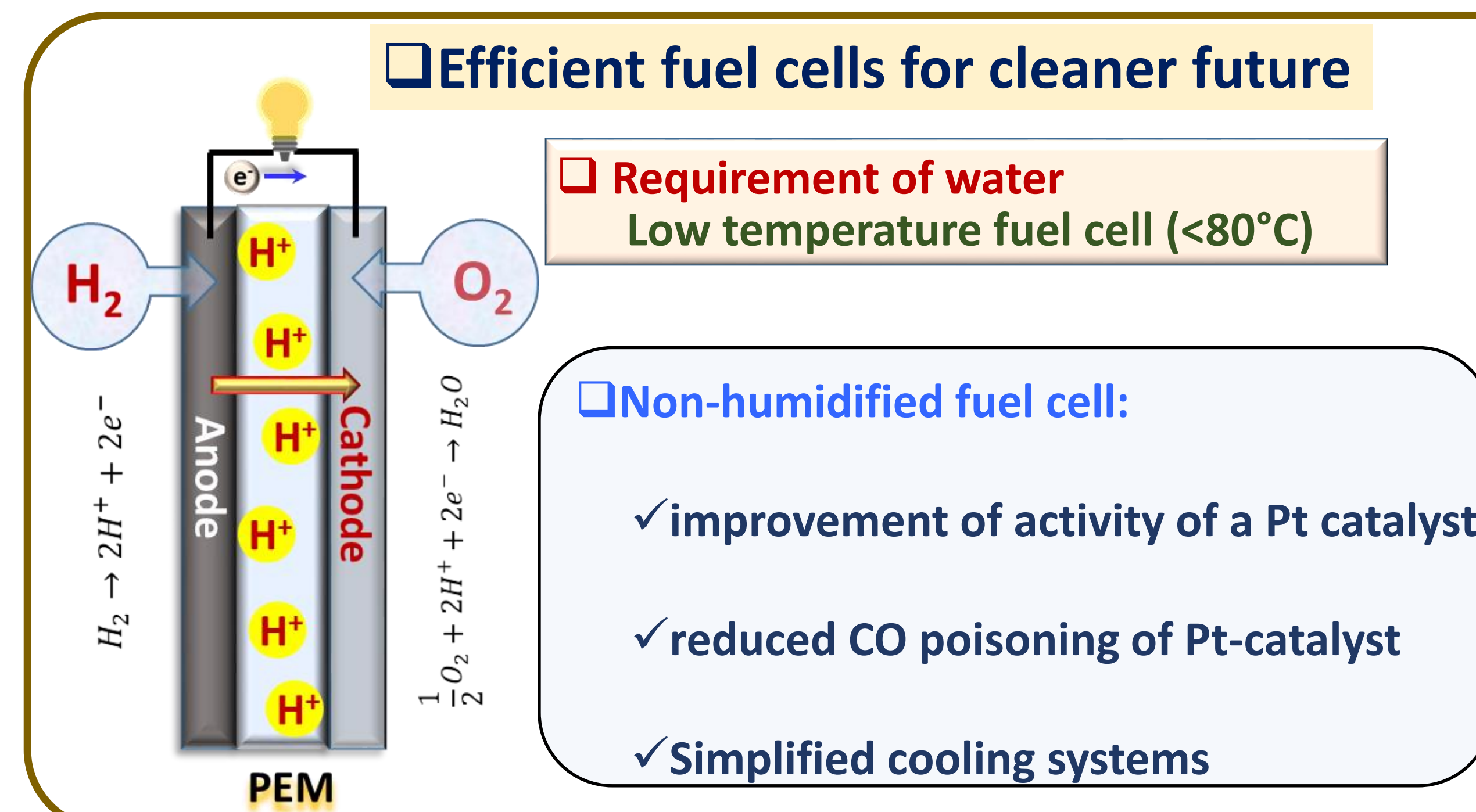


Introduction:



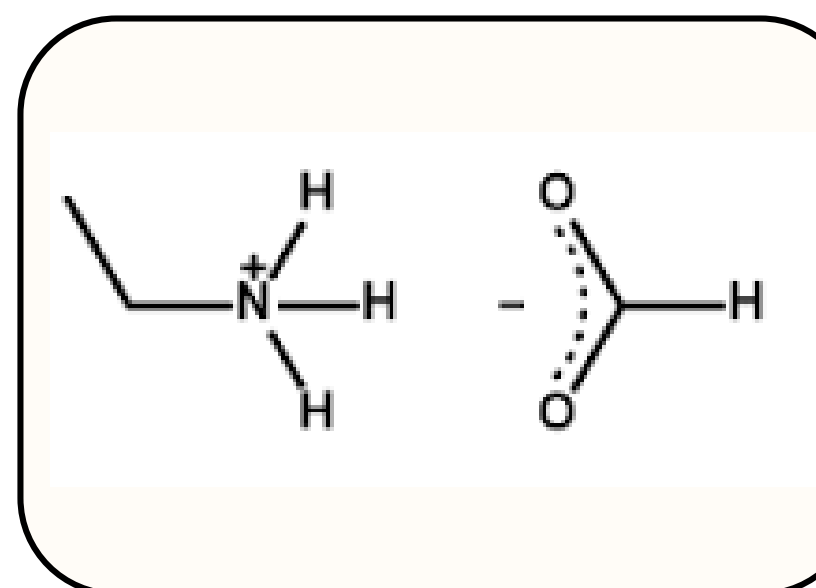
Ionic Liquids: molten salts at room temperature

Protic ionic liquid: with exchangeable protons

Nonvolatility

High thermal stability

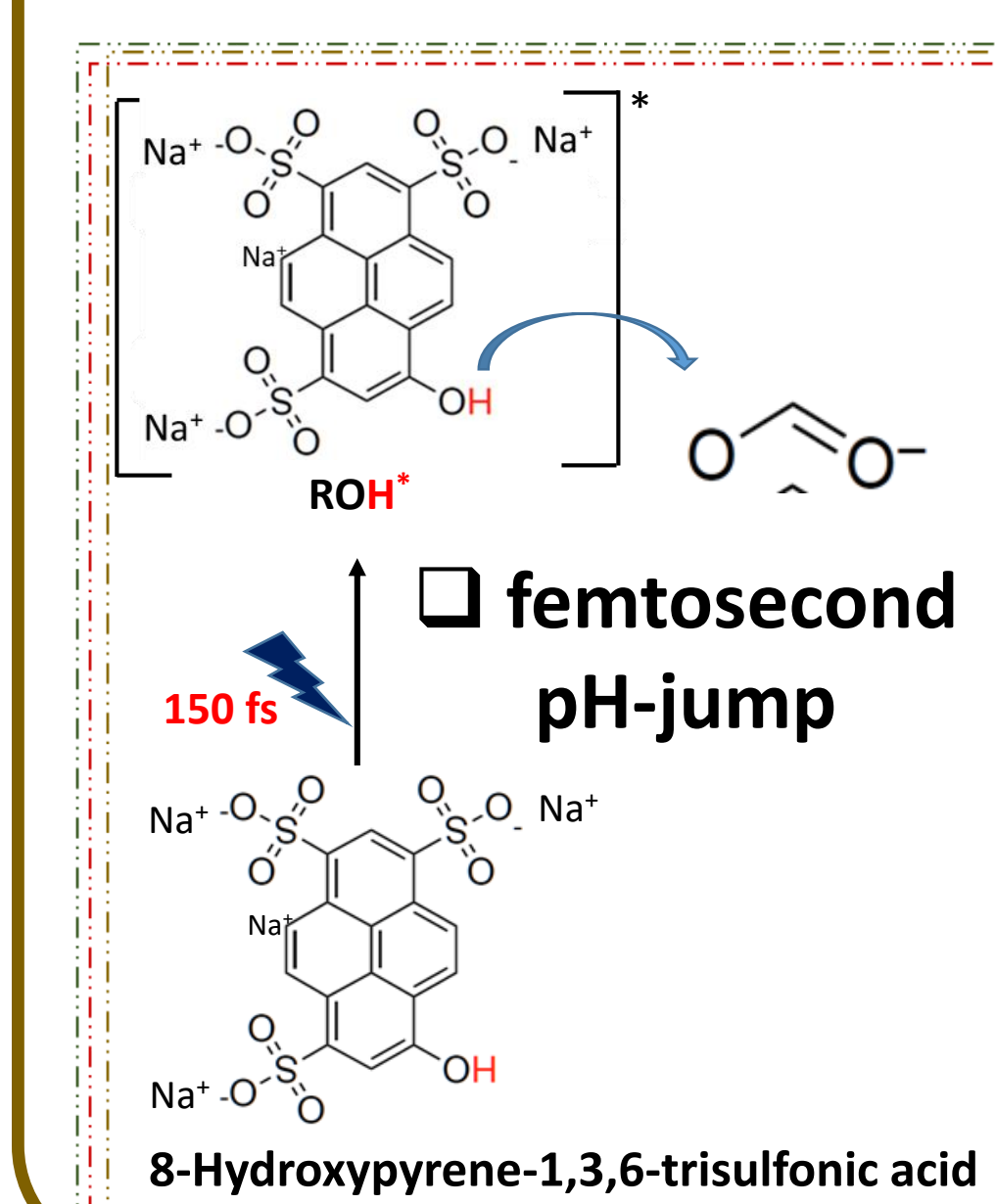
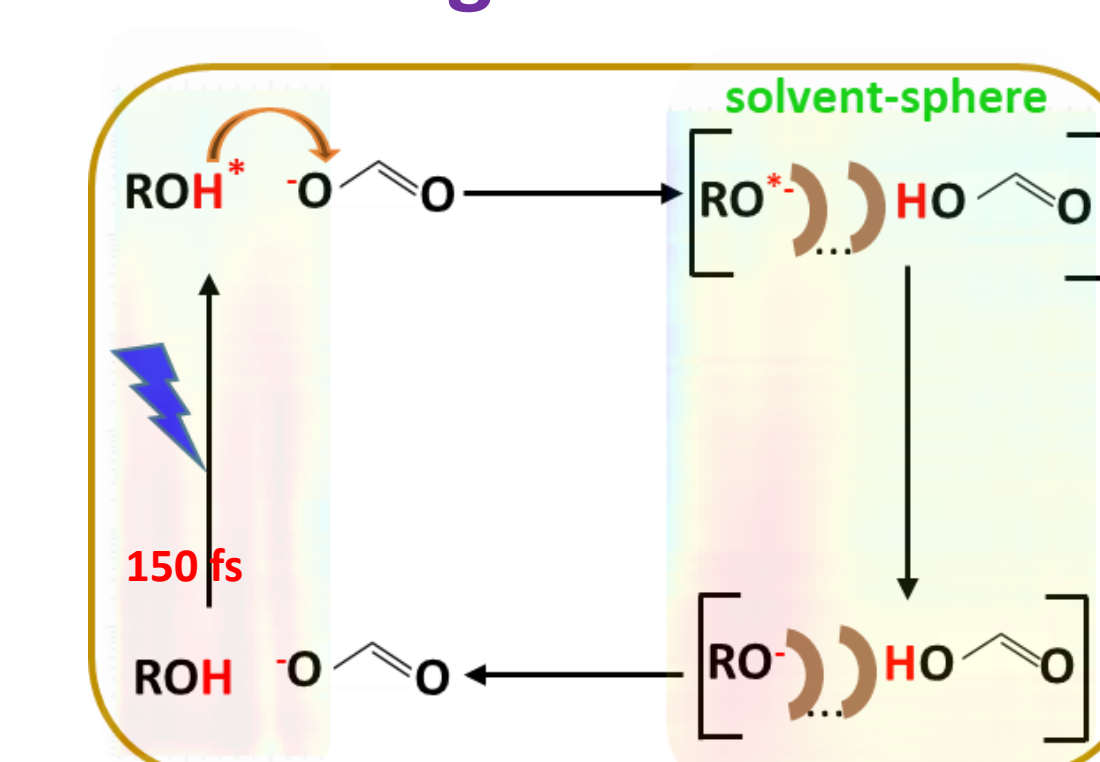
High ionic conductivity



Interest in proton transport mechanism

Aims and Objectives:

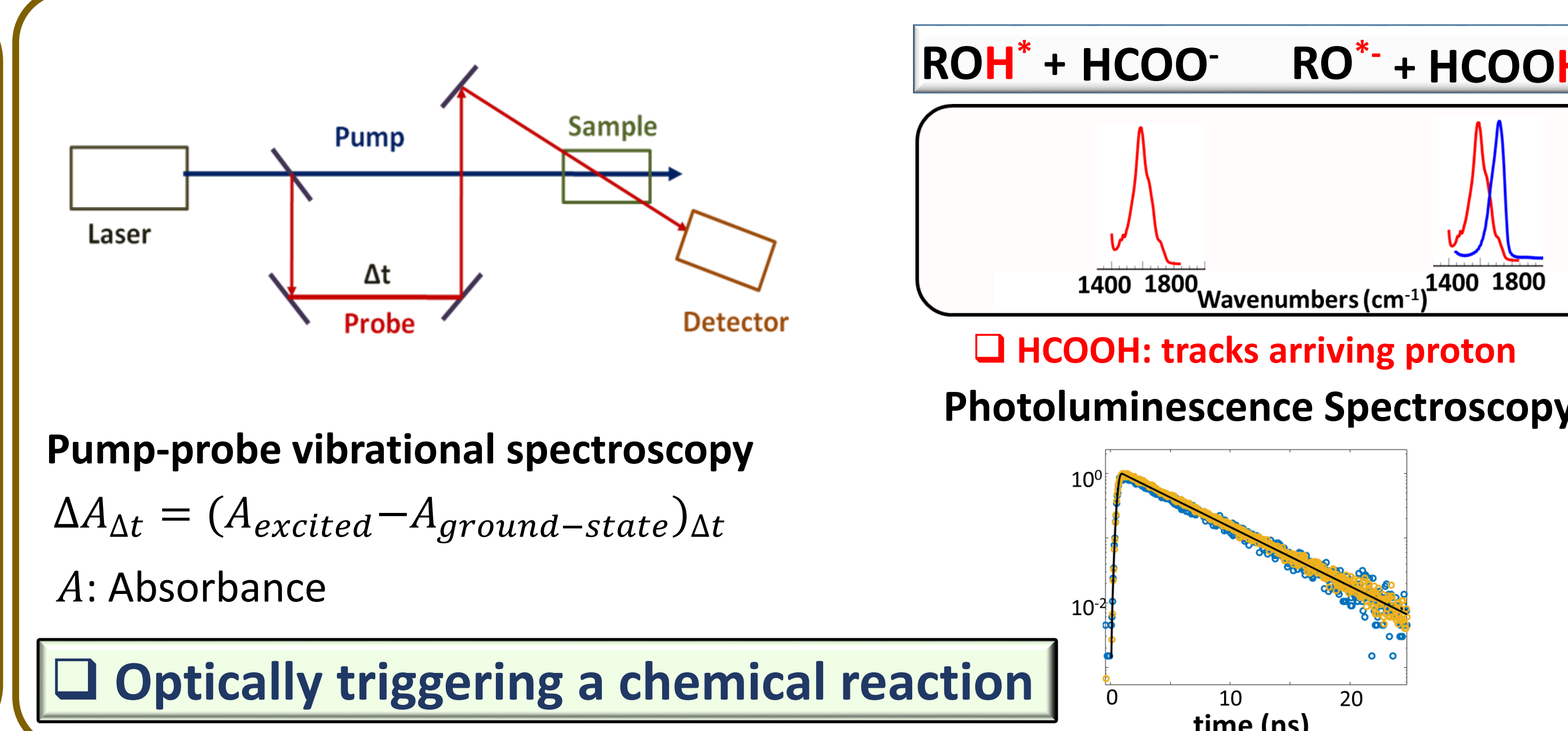
Time-resolved molecular motions through femtosecond lasers



How fast the proton moves?

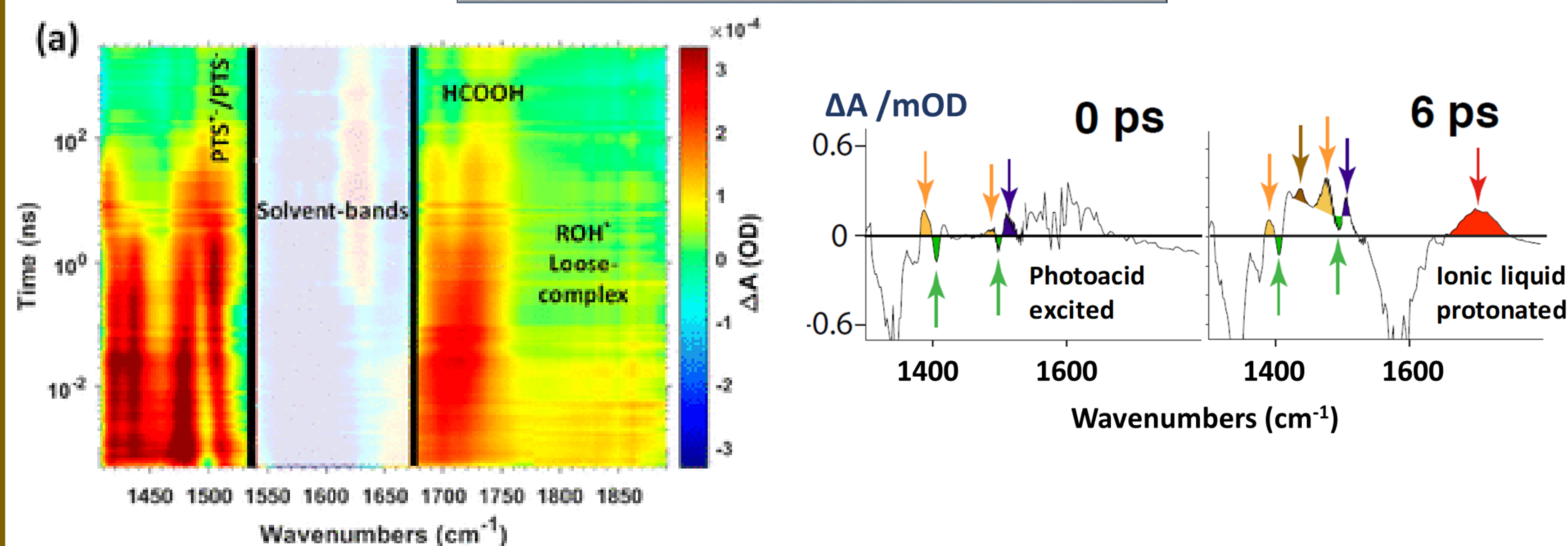
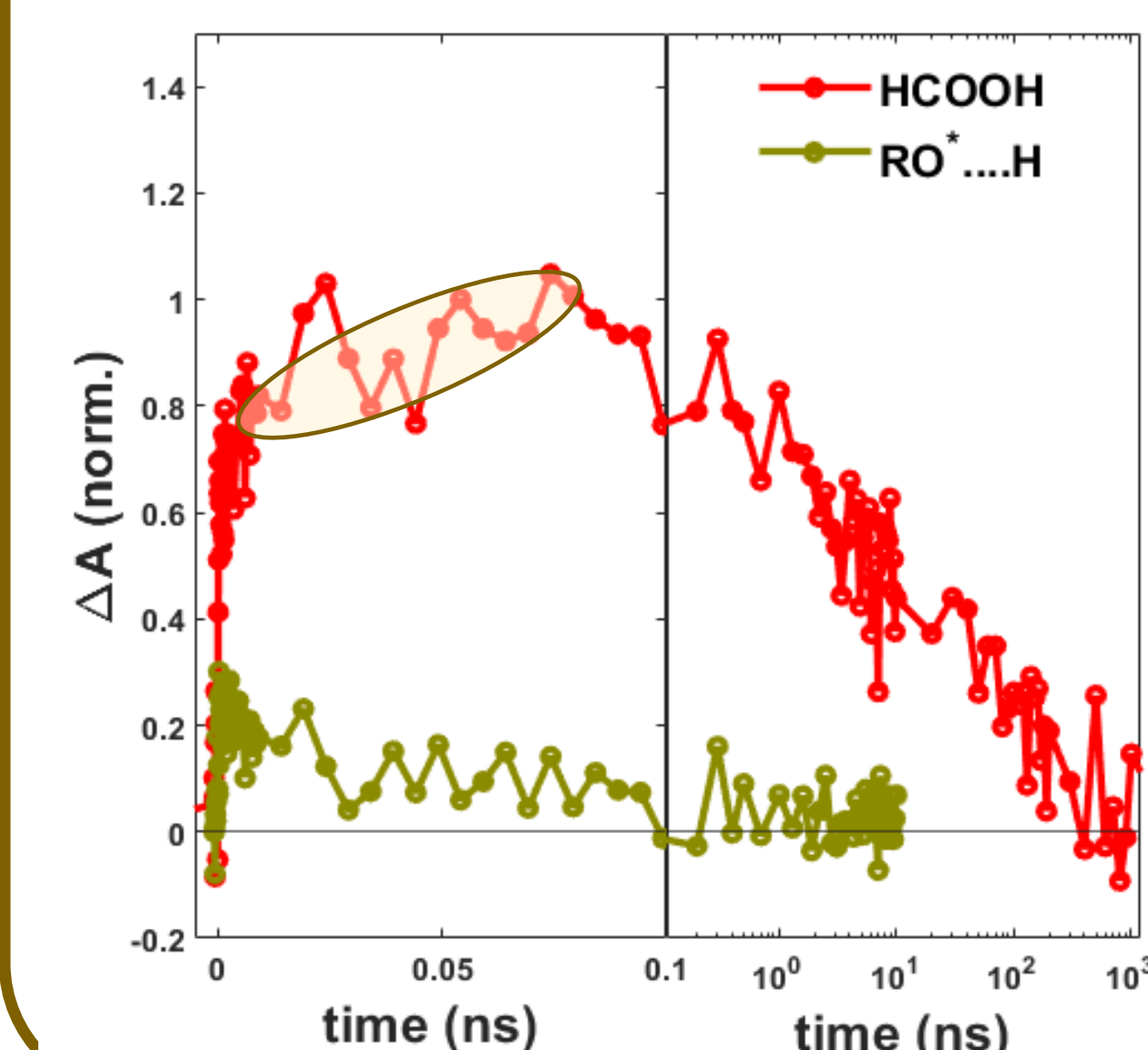
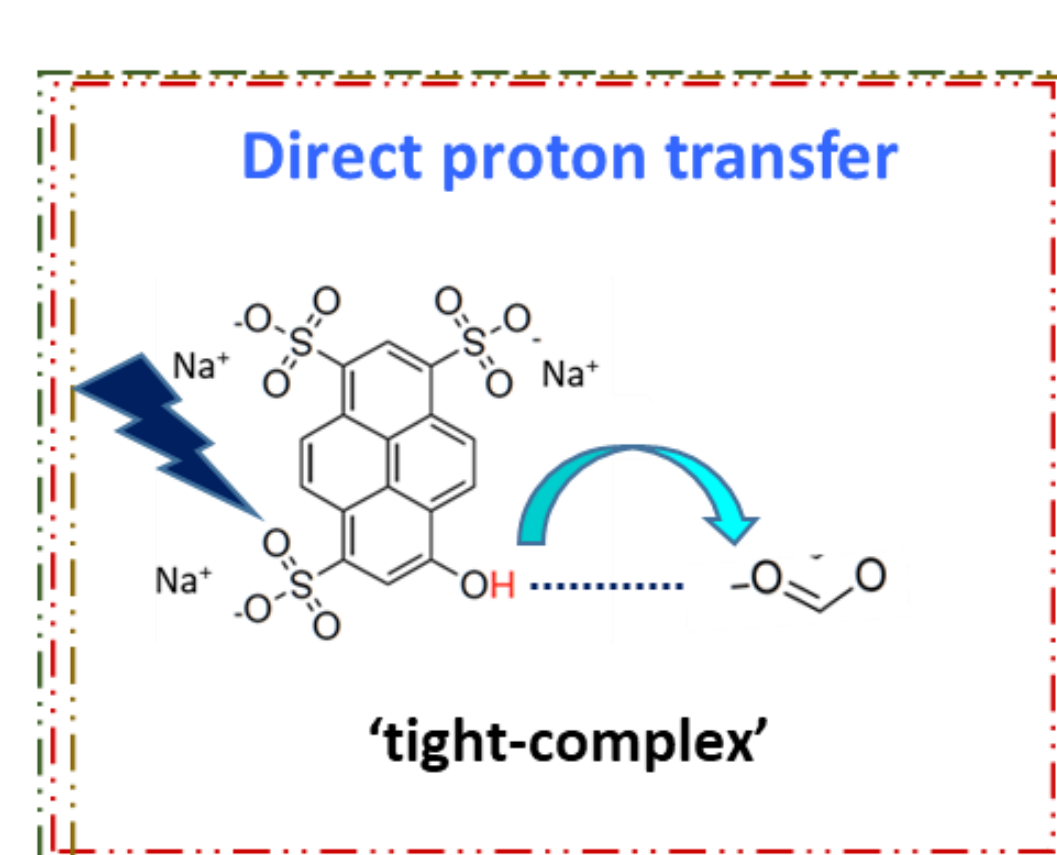
How far the proton goes?

Ultrafast Spectroscopy:

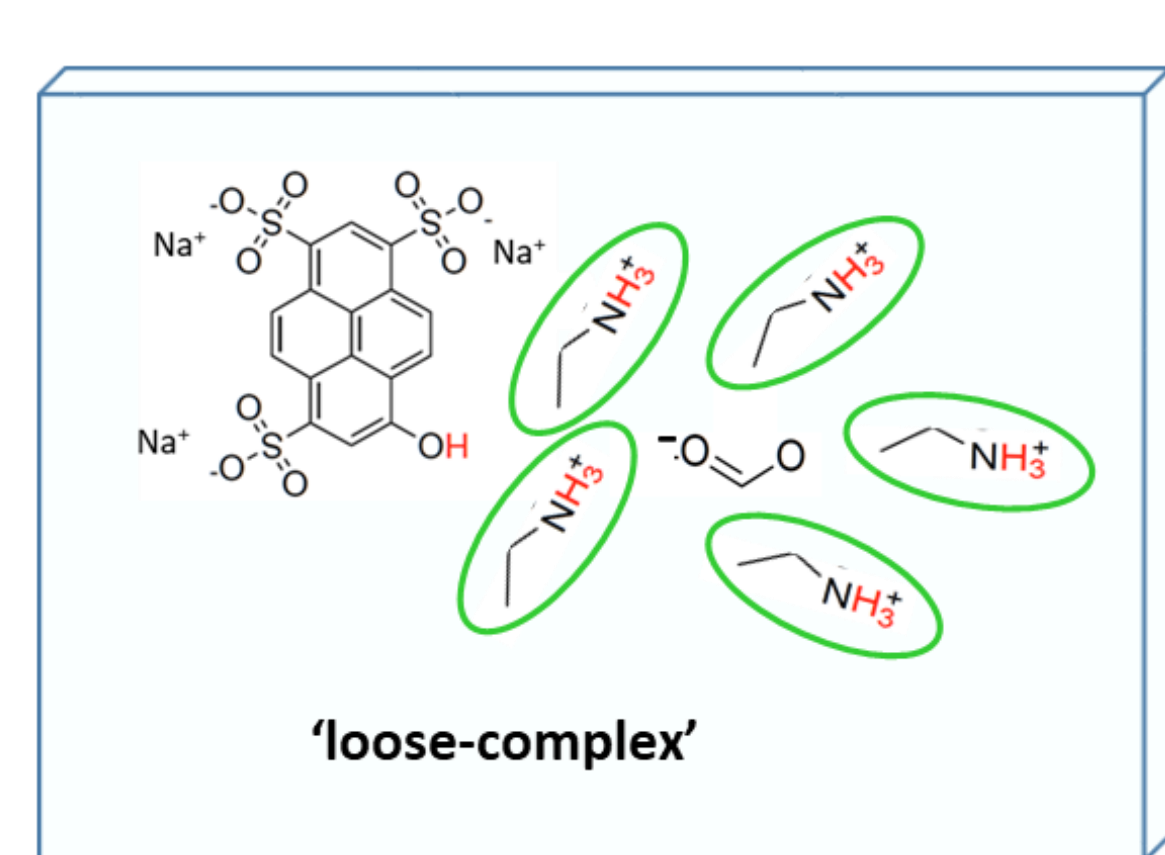


Results and Discussions:

Proton Transfer Mechanism

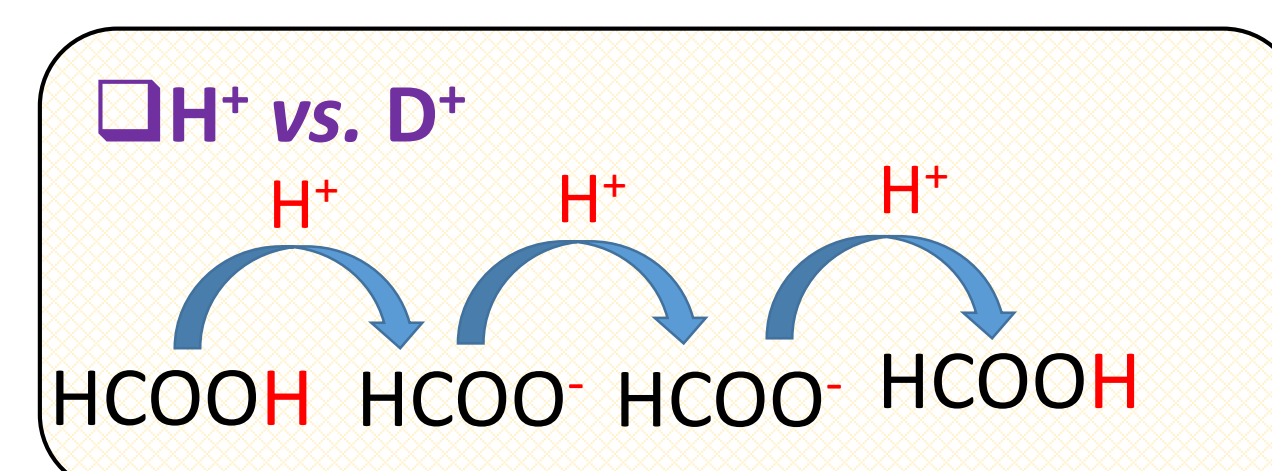
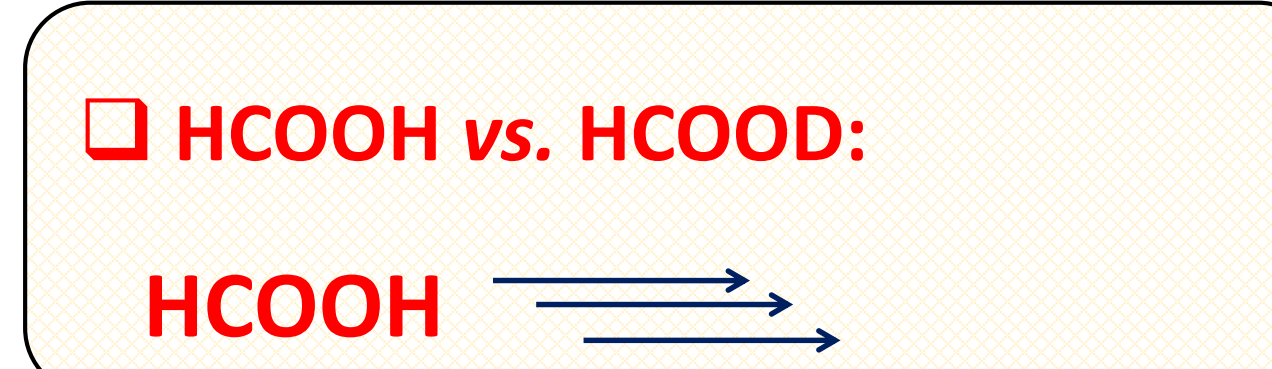


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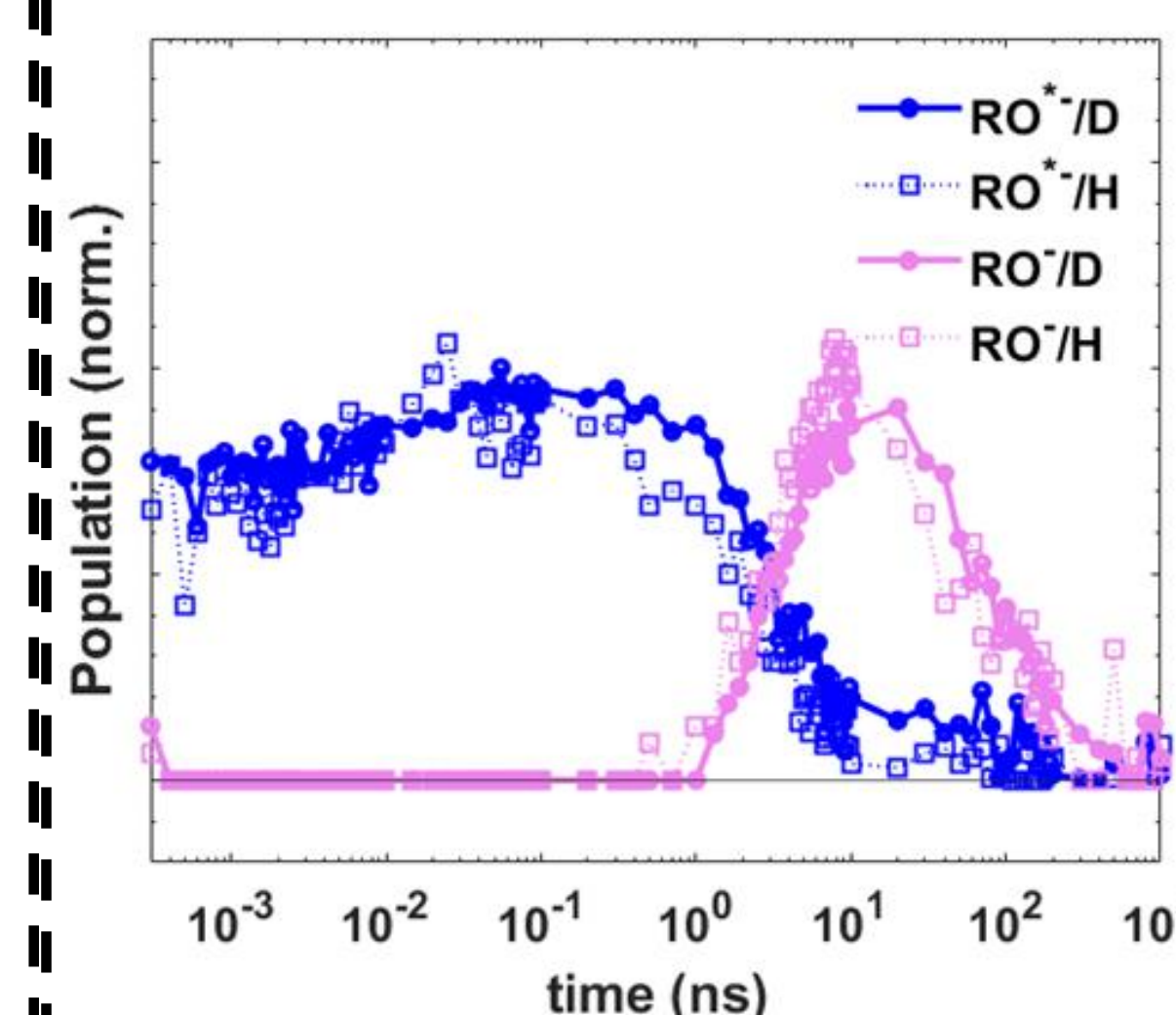
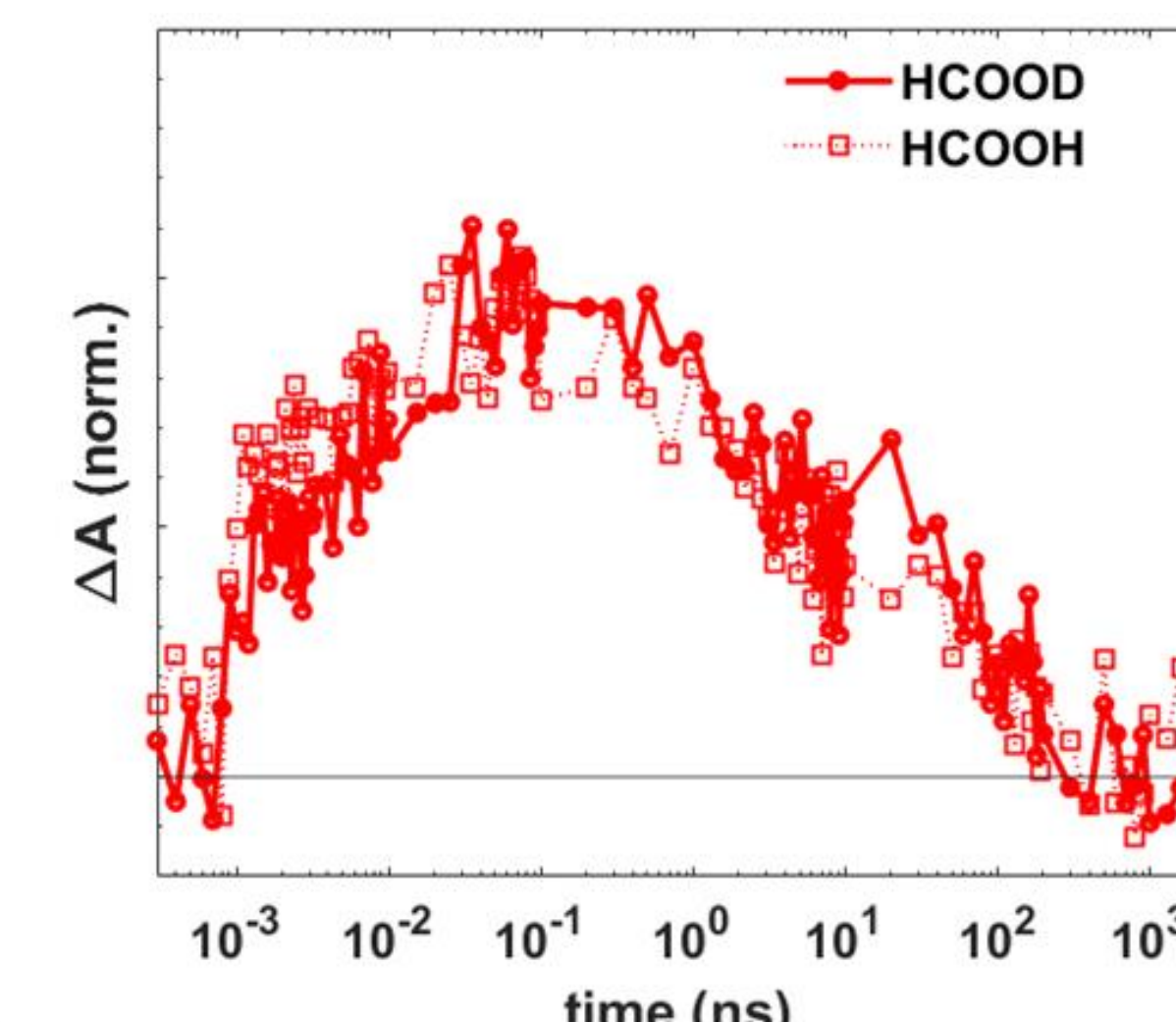
~ 10ps

Proton Transport Mechanism

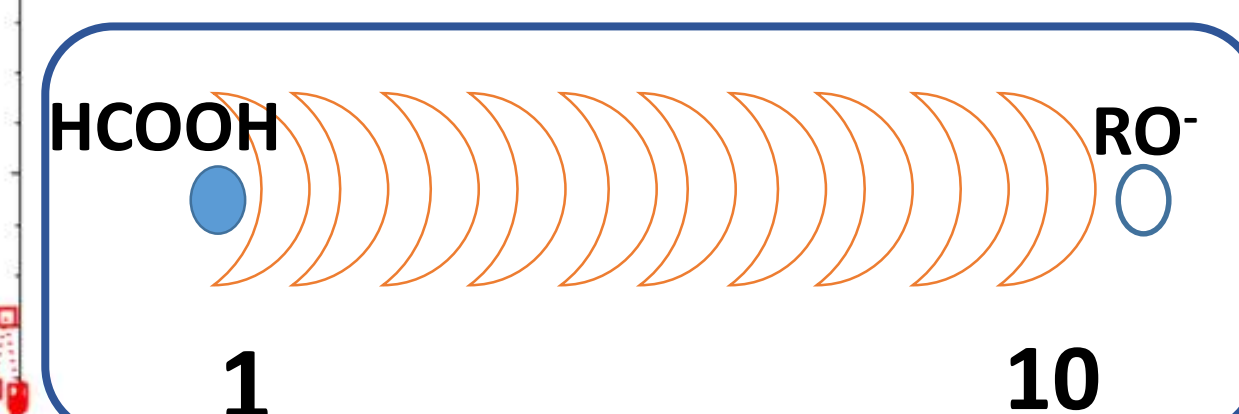


$$k_H/k_D = \sqrt{m_D/m_H} = 1.4 \quad \text{Grotthuss mechanism}$$

$$k_H/k_D = \sqrt{m_{HCOOD}/m_{HCOOH}} = 1.0 \quad \text{Vehicular mechanism}$$



$$L_D = \sqrt{D\tau}$$

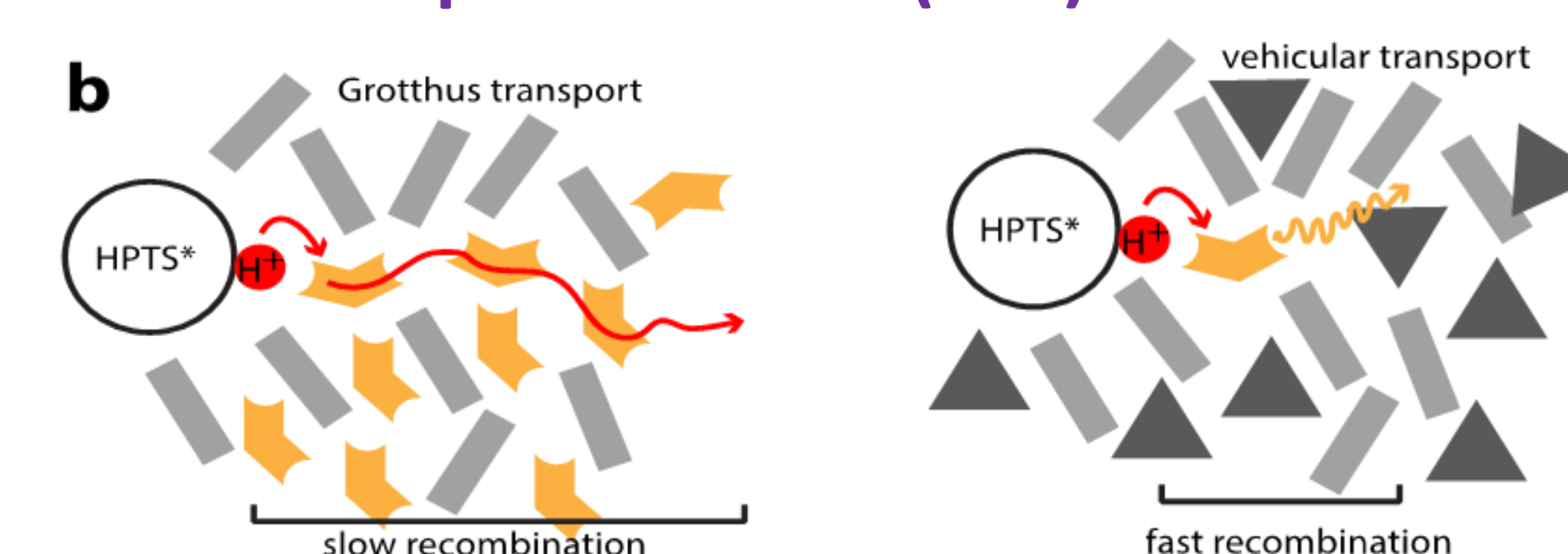


Conclusions/Future Outlook:

Ultrafast proton transfer predominates



Proton transport to a few (~10) solvent shells



Fundamental understanding to predict better electrolytes

Acknowledgement:



Science and Technology Facilities Council



CLF ULTRA UKRI FLF
CLF OCTOPUS

Research Complex at Harwell



Department of Chemistry

