

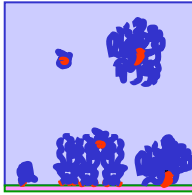


# Vibrational spectroscopic characterization of proteins and related biomaterials

G. D. Chryssikos, V. Gionis *et al.*

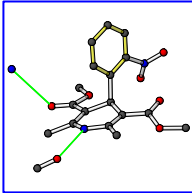
## Vibrational spectroscopy @ TPCI-NHRF

- FT-Raman,  $\lambda=1064$  nm
- Dispersive Raman,  $\lambda=514.5$  nm, 418 nm
- Confocal Raman microscope,  $\lambda=514.5$  nm, 418 nm, 633 nm, 785 nm
  
- FT-NIR, 4000-12000  $\text{cm}^{-1}$ , optical fiber probes, integrating sphere
- FT-IR, 400-7000  $\text{cm}^{-1}$ , MCT detection, ATR(C, Ge, Si), microscope
- Vacuum FT-IR, 15-5500  $\text{cm}^{-1}$
- Vacuum FT-IR, 30-3500  $\text{cm}^{-1}$ , specular reflectance
  
- Chemometrics



## Kinetics of adsorption from micellar solutions

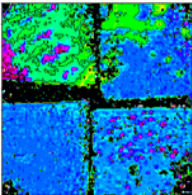
Macromol. Symp. **205**, 117 (2004)



## Drug polymorphism - Vitreous drugs

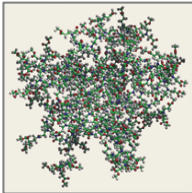
J. Raman Spectroscopy, **35**, 353 (2004)

Phys. Chem. Glasses, **46**, 144 (2005)



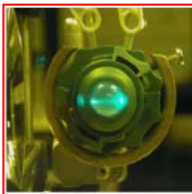
## Drug devitrification as a function of T and RH

Vibrational Spectroscopy, **43**, 221 (2007)



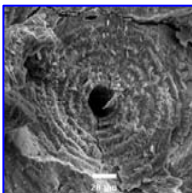
## Drug-dendrimer molecular interactions

Int. J. Pharm. **339**, 231 (2007)



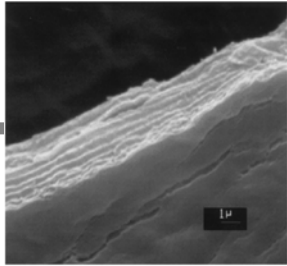
## Non-contact detection of ocular drugs

J. Biomed. Optics, **12(3)**, 034005 (2007)



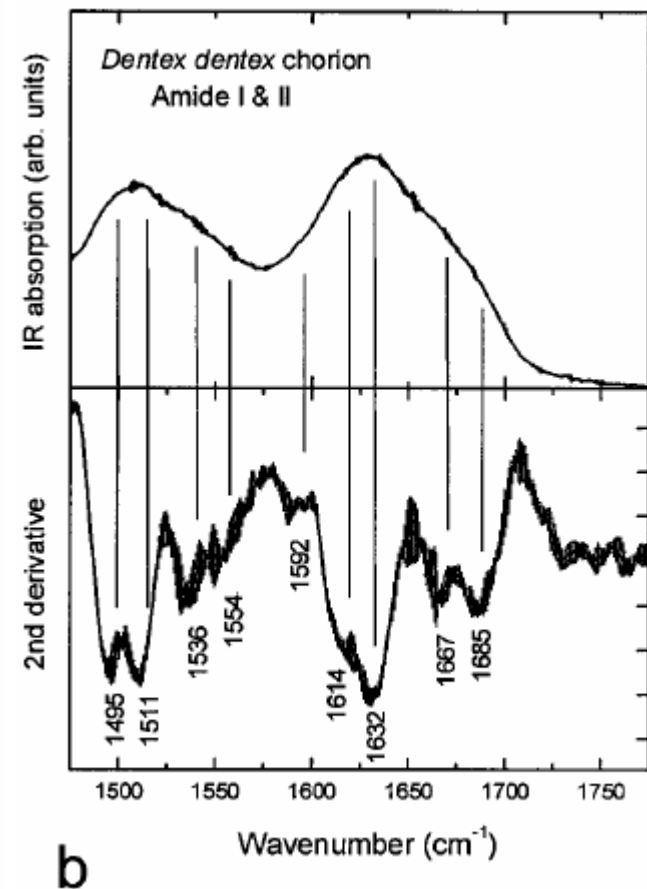
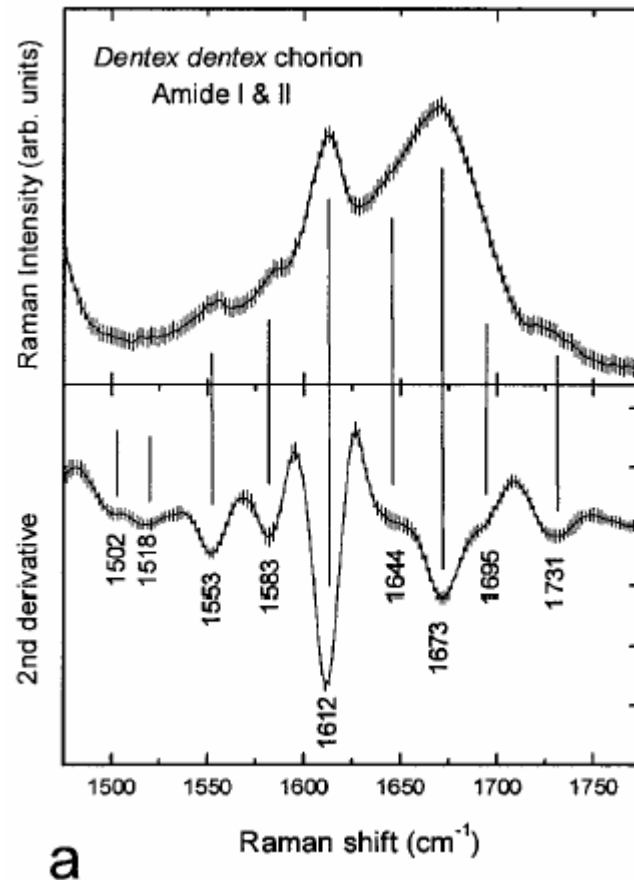
## Diagenetic aspects of skeletal hard tissues

*PALAEO3*, in press (2008)



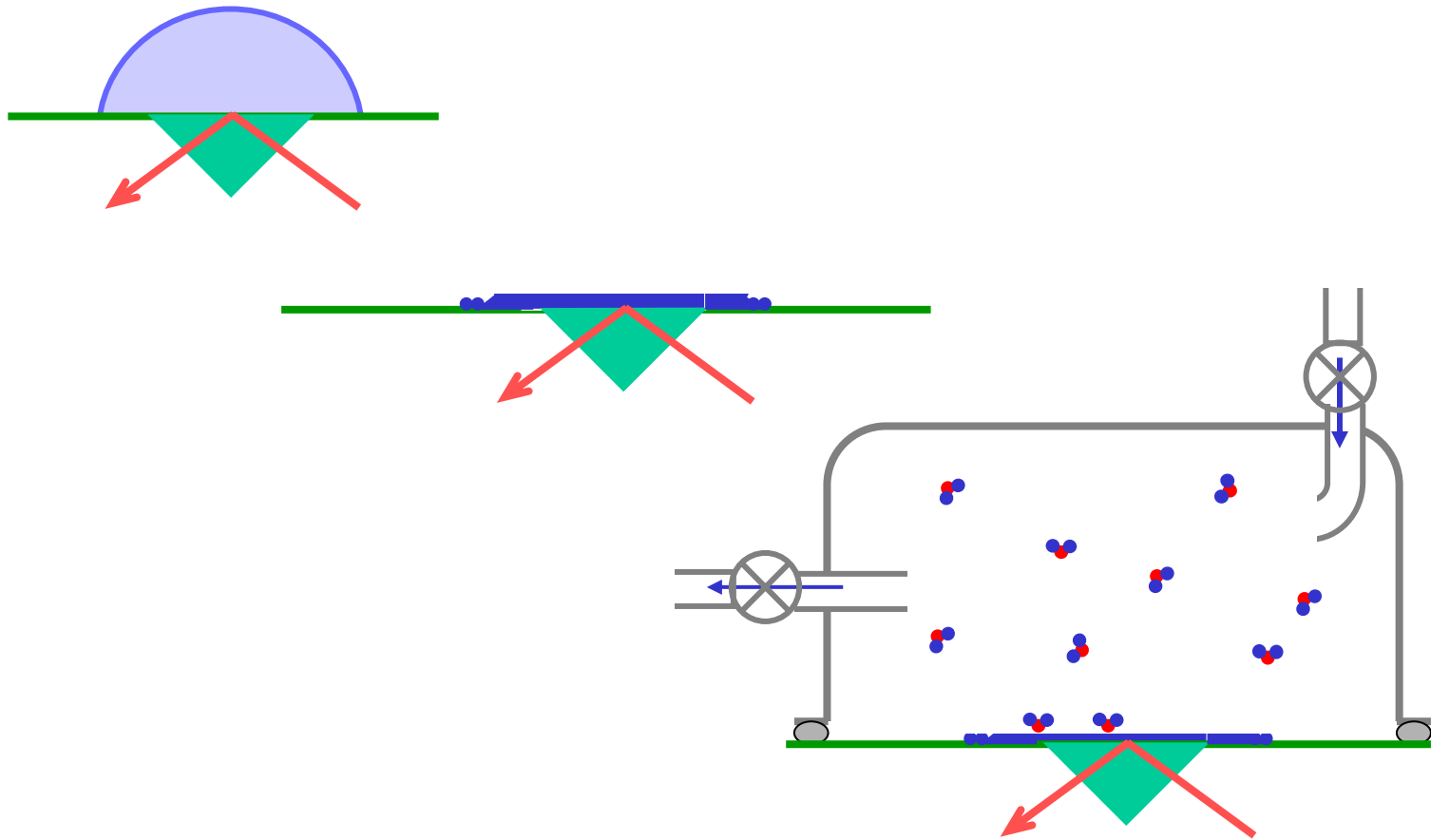
# Characterization of structural proteins

FT-Raman, ATR, chorion, soft cuticles, egg cases



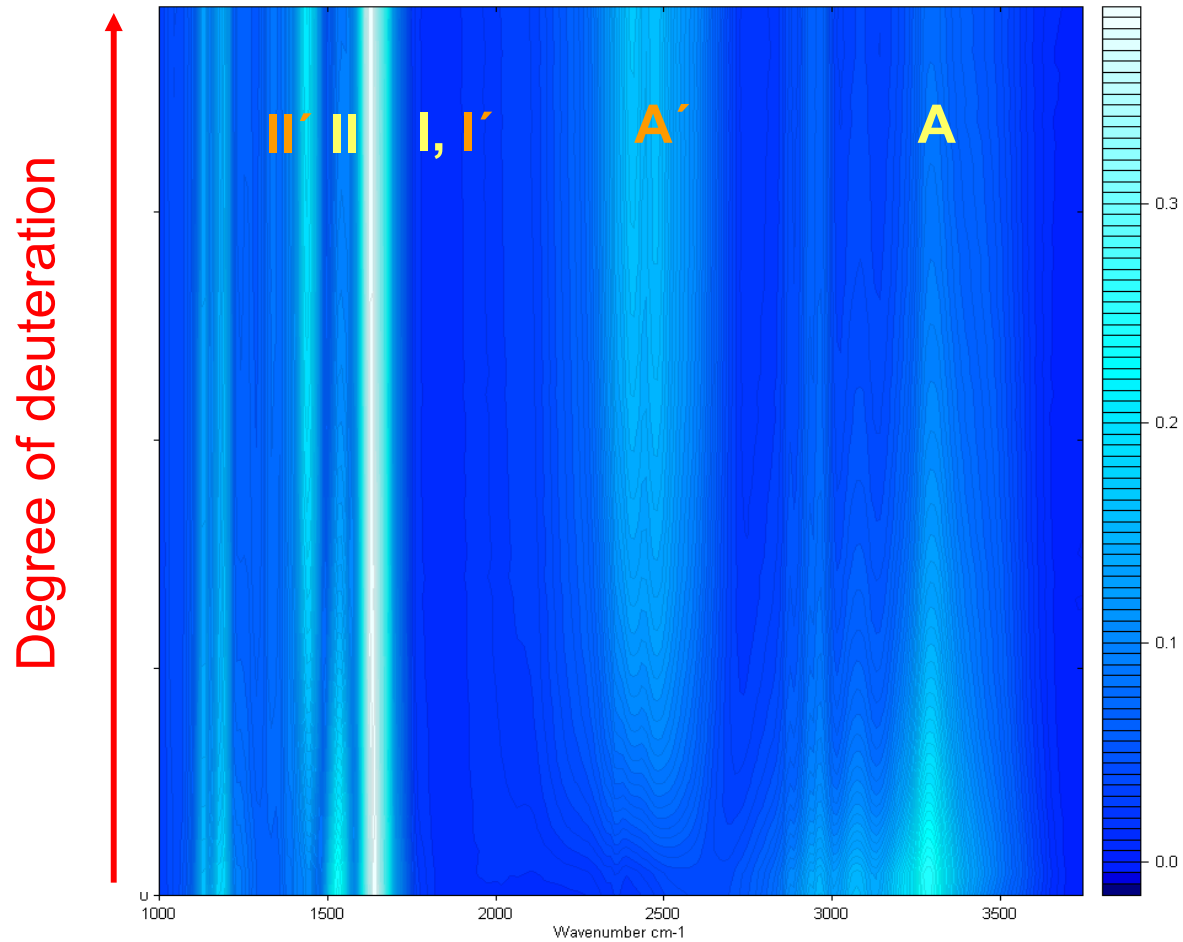
*Int. J. Biol. Macromol.*, 41, 102 (2007)  
*Insect Biochem. Molec. Biol.*, 31, 877 (2001)  
*J. Struct. Biol.*, 132, 112 (2000)

# Non-destructive FT-IR by ATR



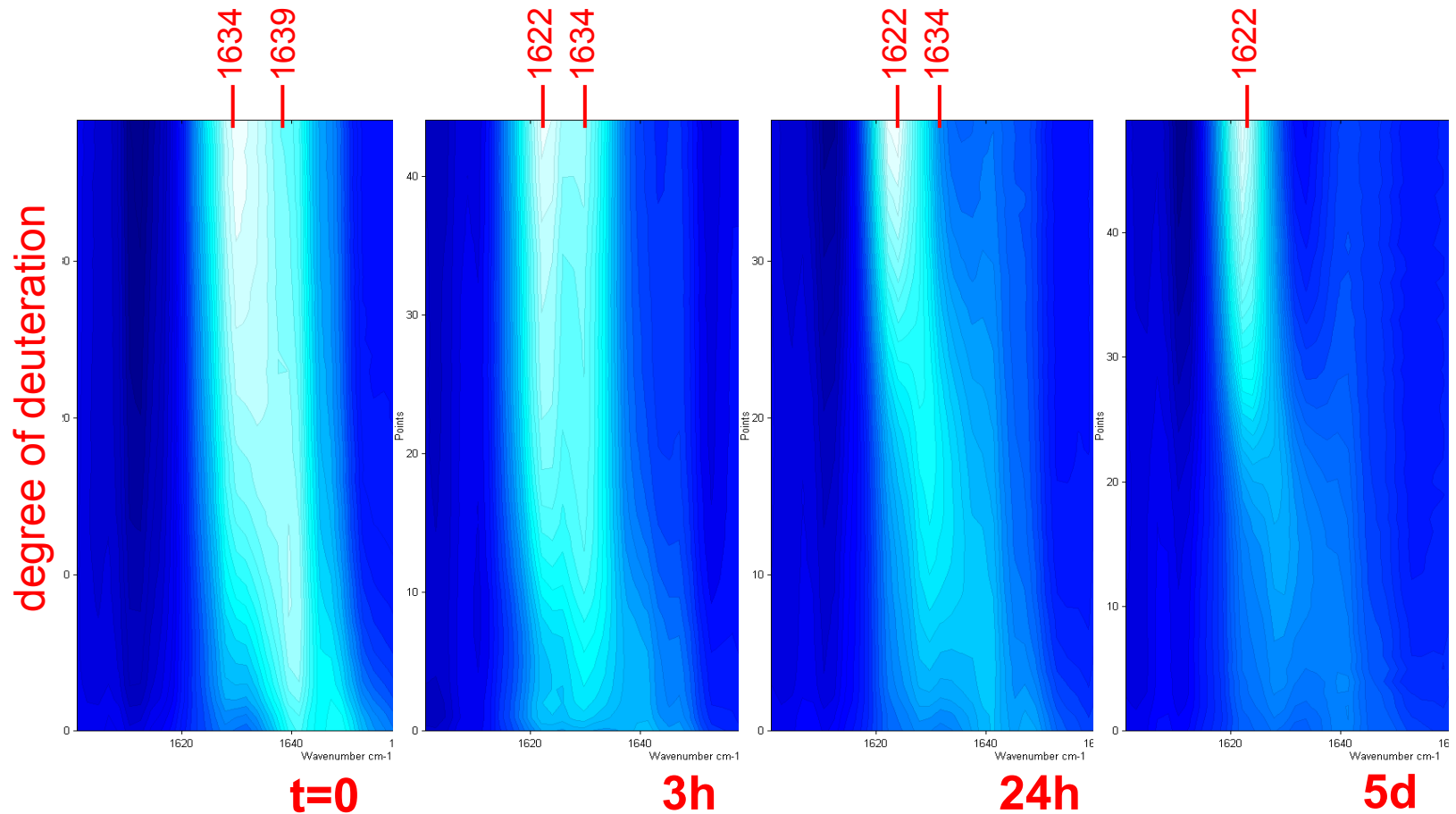
# 2ndary structure of proteins

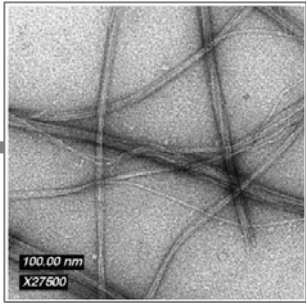
ATR, deuteration, real-time monitoring



# 2ndary structural changes of proteins

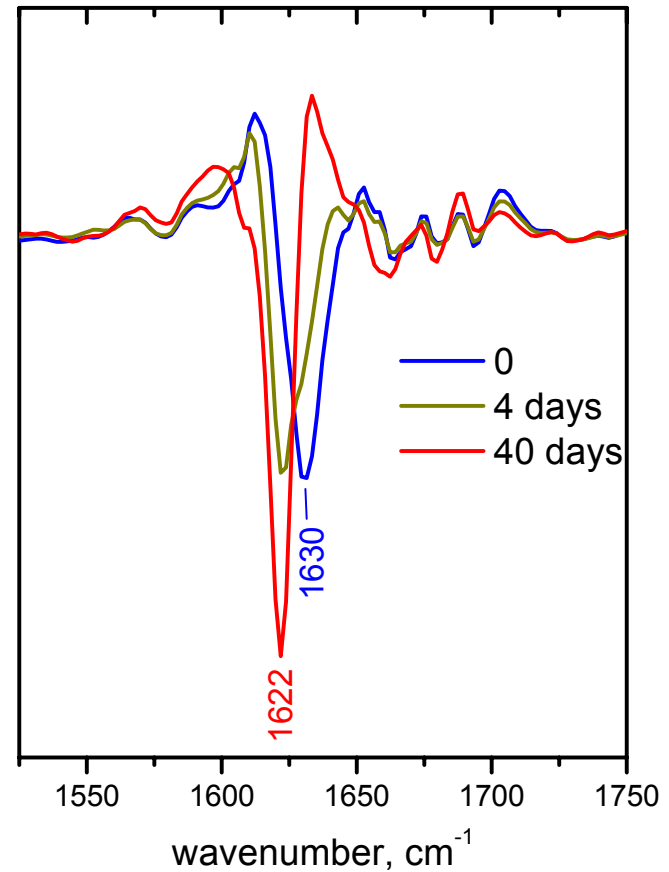
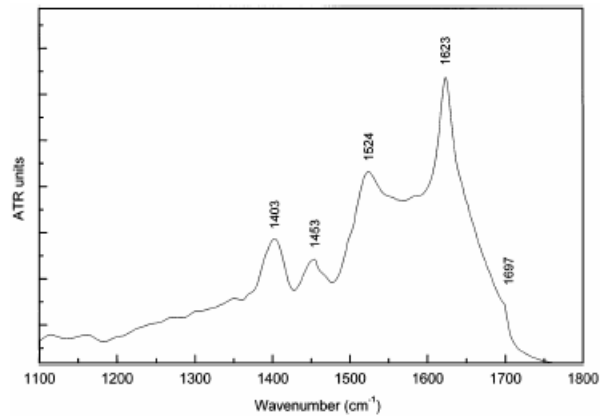
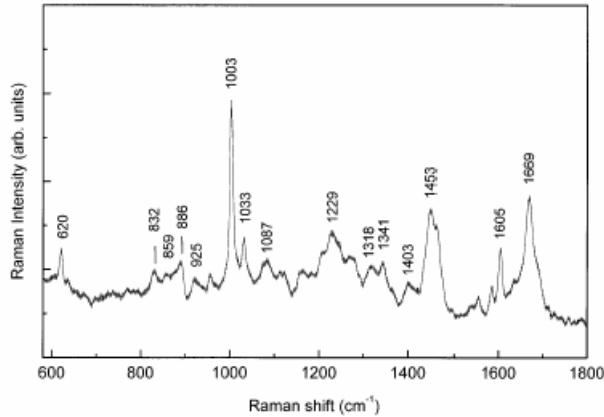
ATR, deuteration, real-time monitoring





# Amyloid formation propensity

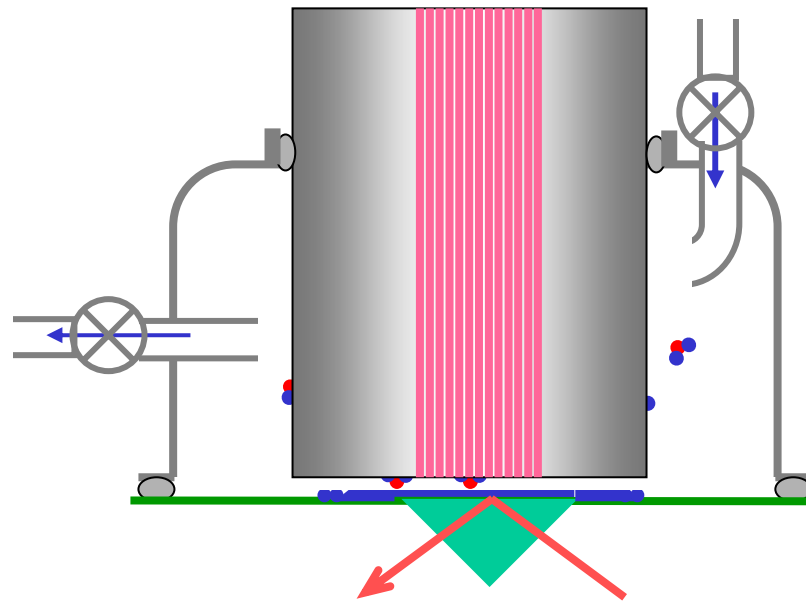
self assembly, FT-Raman, ATR, CD, XRD, Congo red staining, light scattering



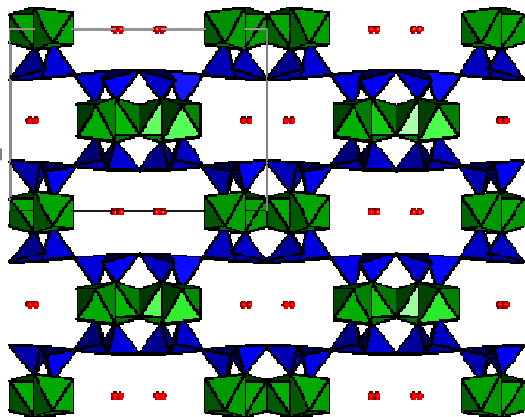
*J. Struct. Biol.*, 156, 480 (2006)  
*FEBS Lett.* 499, 268 (2001)



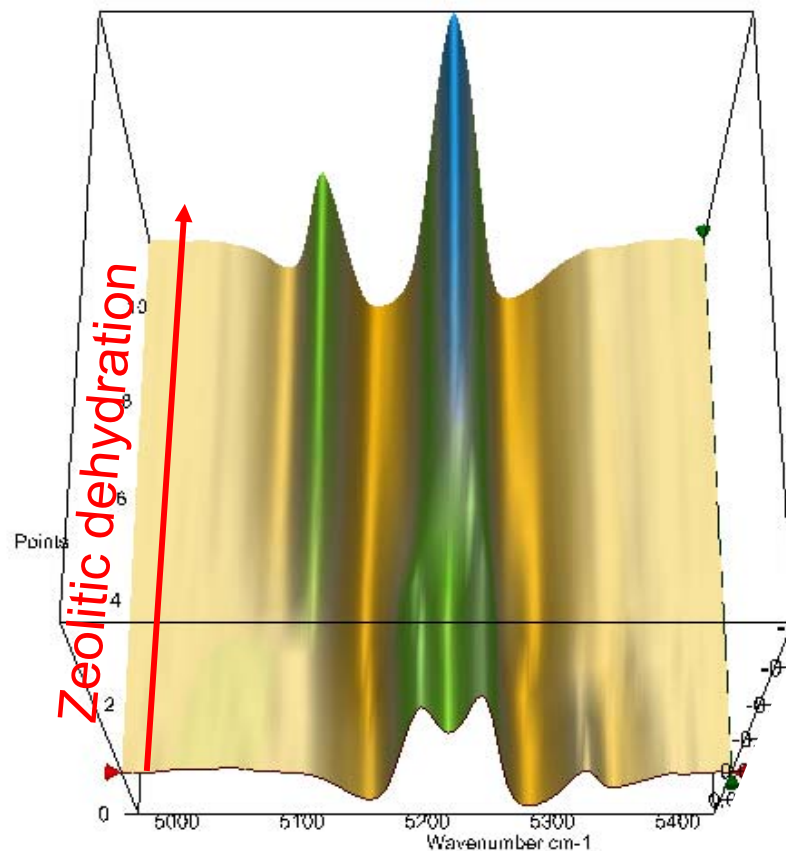
# Synchronous ATR-NIR spectroscopy



## Spectroscopy of water: mapping sites



Chiari et al. 2003



Am. Miner., **91**, 1125, (2006)

# Spectroscopy of water: accessibility and reactivity

