Ice nucleation by long chain alcohols

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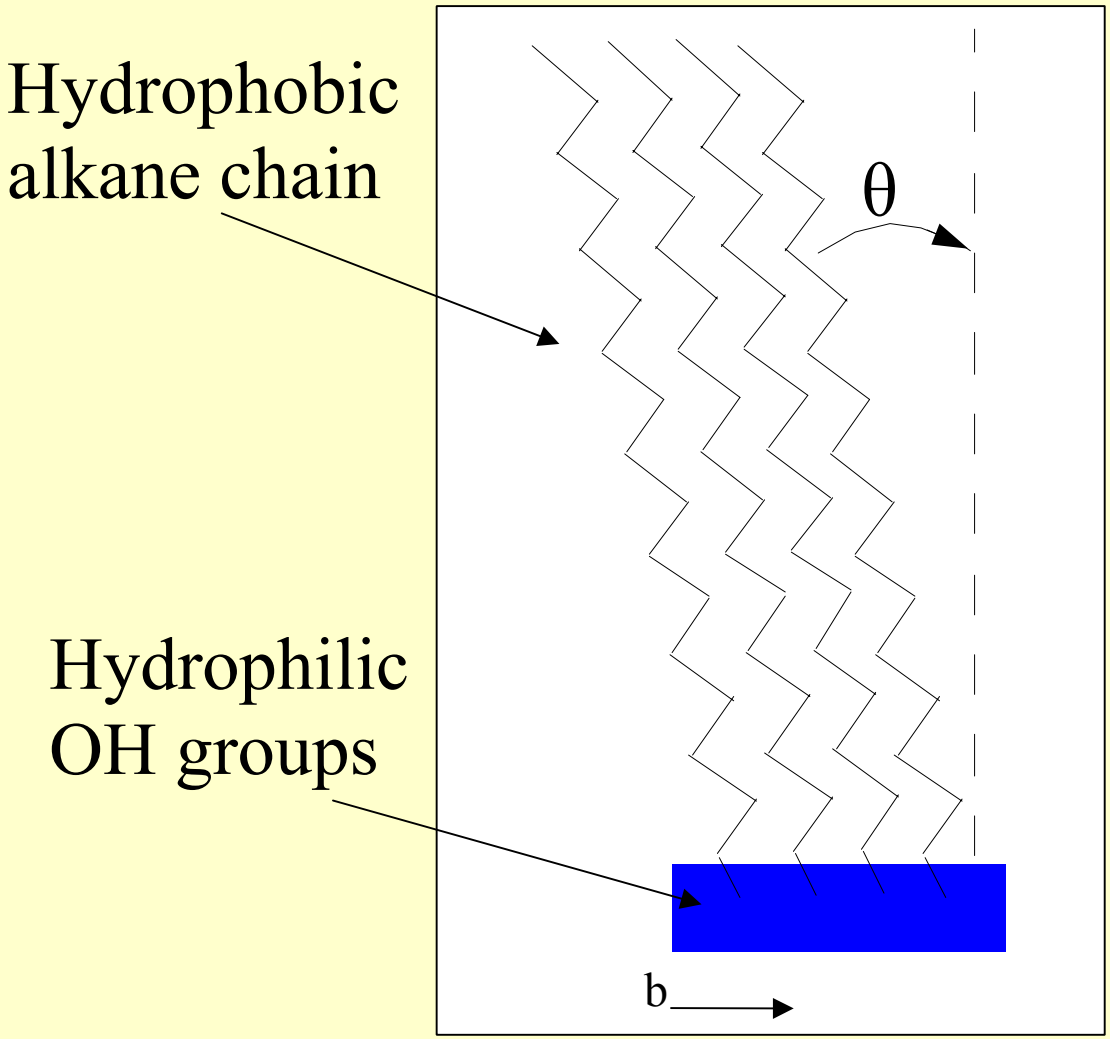
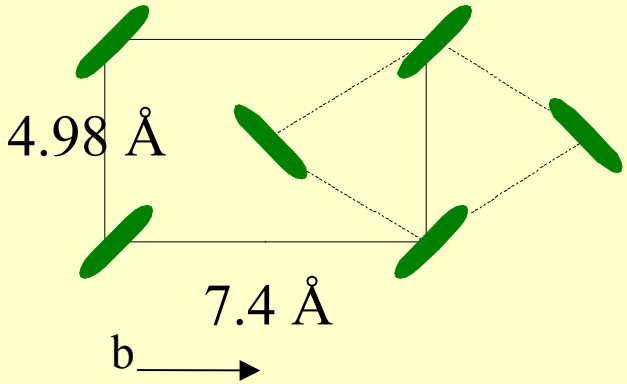
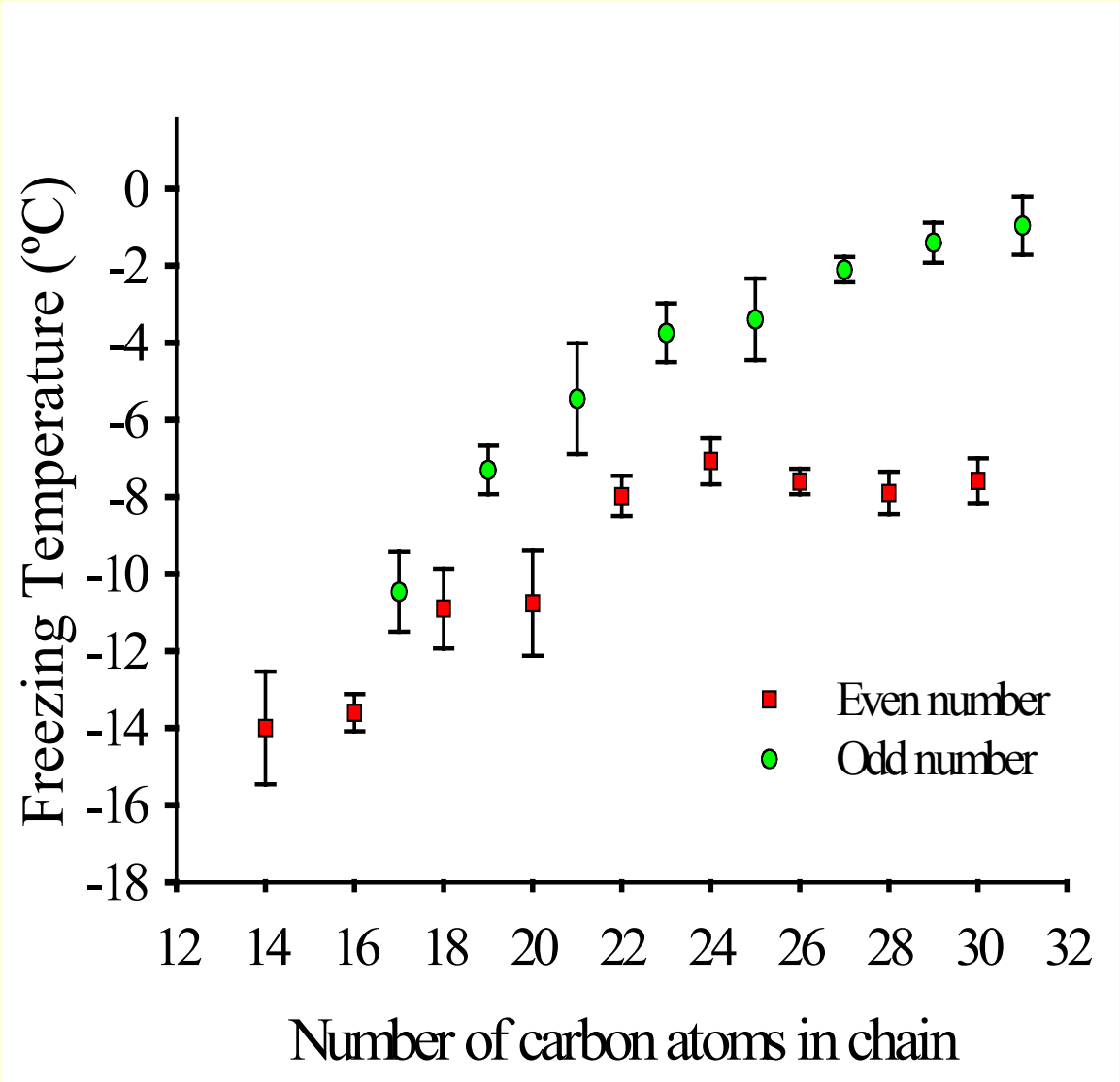






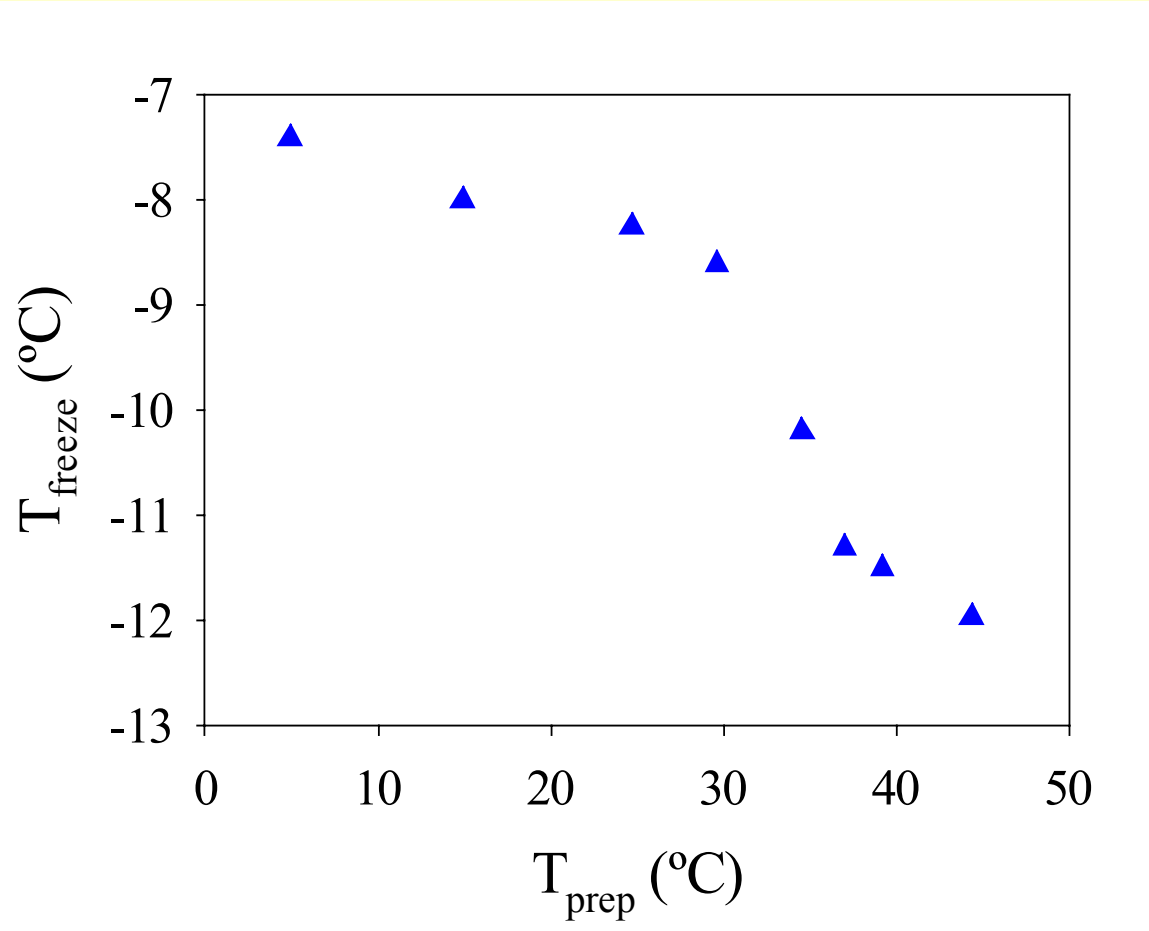
Popovitz-Biro et al., 1994

Percent mismatch between ice lattice and alcohol: 0.4

PbI also has a 0.4% mismatch – characteristic freezing T of -6 ºC.

As the chain length increases, the crystalline domains become larger – i.e. defects become less important.

Freezing temperature of pentacosanol ($C_{25}H_{52}OH$) on water as a function of preparation temperature

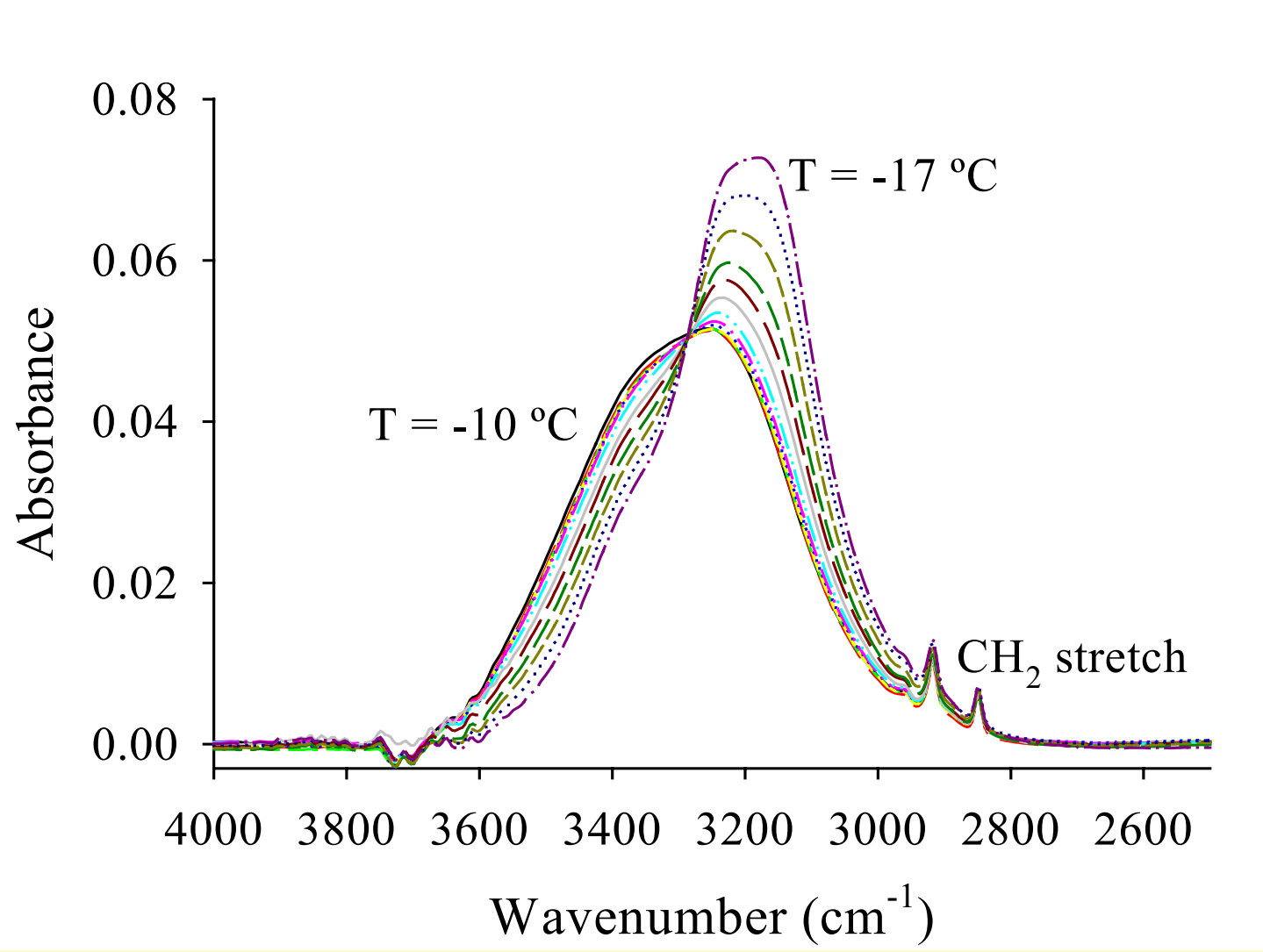


Preactivation – an increase in the freezing temperature after the ice nucleator has catalyzed the phase transition once or has been cooled below -40ºC

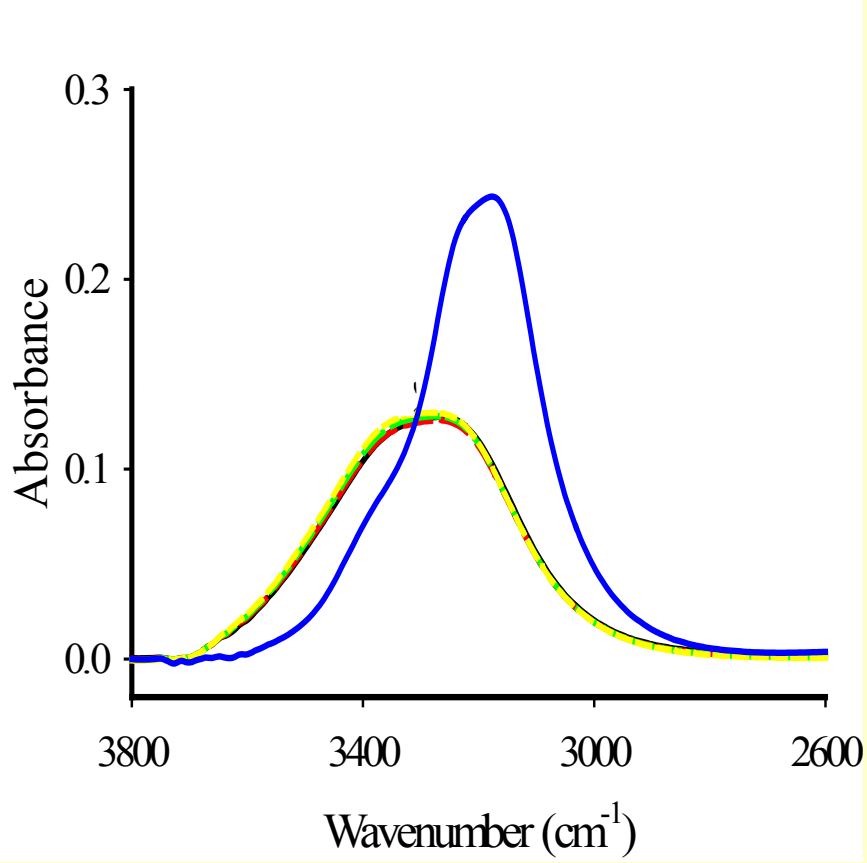
Seeley and Seidler, 2001

Seeley and Seidler hypothesize that the "preactivation" they observe is due to an ordered layer of water at the water-alcohol interface. That ordered layer is disrupted at high temperatures.

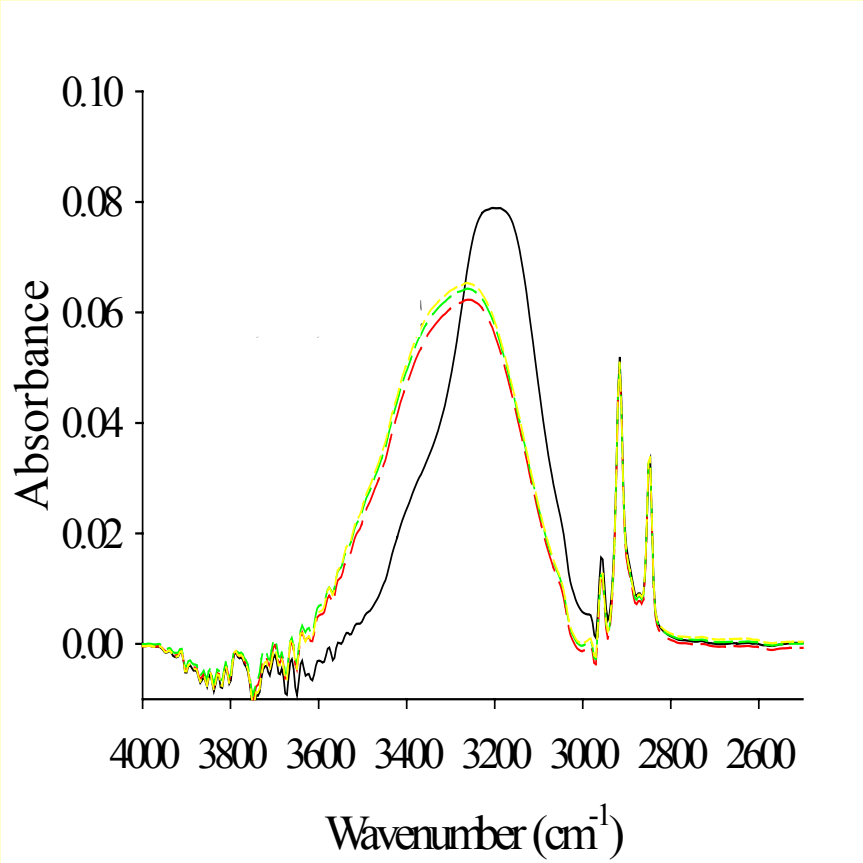
Infrared spectra of $C_{17}H_{35}OH$ on water as a function of T

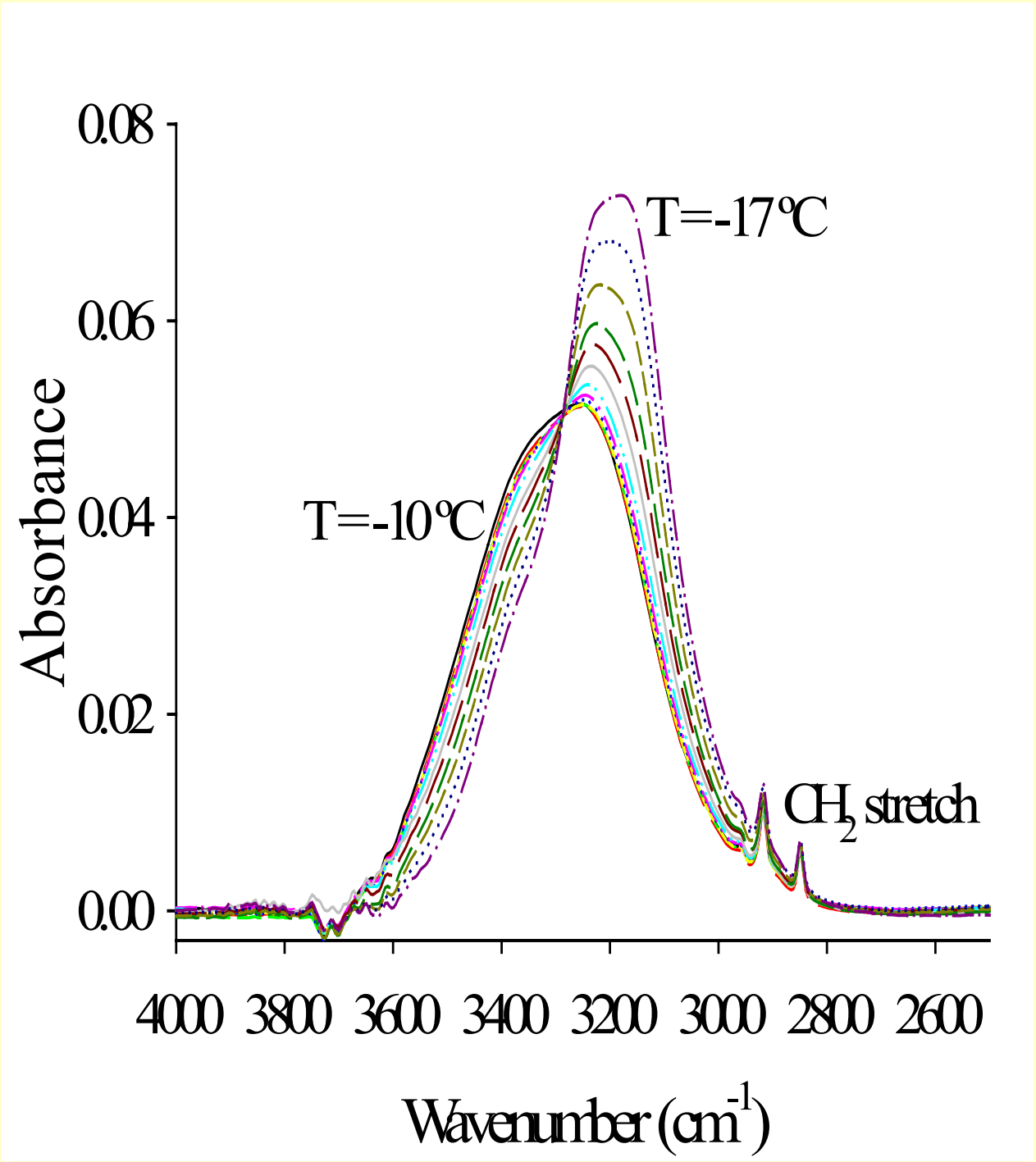


Freezing of pure water



Freezing of water covered by a film of $C_{17}H_{36}$





Conclusions

High molecular weight organic compounds are present in the atmosphere (e.g. biomass burning) and we don't know much about how they act as ice nucleators.

They provide unique opportunities as model substrates.