

Seminar

Friday, 22 May 2009

11 am - Room 701

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Polar fish to methane hydrates - the stochastic nature of heterogeneous nucleation

Non-equilibrium systems tend to reach equilibrium eventually, but a unified theory characterizing this evolution in time is still lacking, especially for the liquid to solid transition. The statistics of liquid-to-crystal nucleation are measured rigorously by using a recently developed automated lag-time apparatus (ALTA). ALTA repeatedly supercools one sample until the onset of nucleation then heats the sample to ensure melting of all residual ice crystals prior to the next run. This cycle is repeated on the same sample and the technique provides an advantage over trying to prepare and monitor say 300 individual identical samples.

Analysis of the data, coupled with a second kind of experiment, shows that the statistics of heterogeneous nucleation are consistent with a first-order kinetic mechanism over a wide range of supercooling temperatures. The limitations of classical nucleation theory are exhibited.

Our analysis unifies many related experiments in biology, physics, chemistry, and chemical engineering. I will discuss examples ranging from Antarctic fish "antifreeze" proteins to methane hydrates formed at 10 MPa.

All Welcome

Contact Details

For further information phone 364 2404, or visit our website: www.phys.canterbury.ac.nz