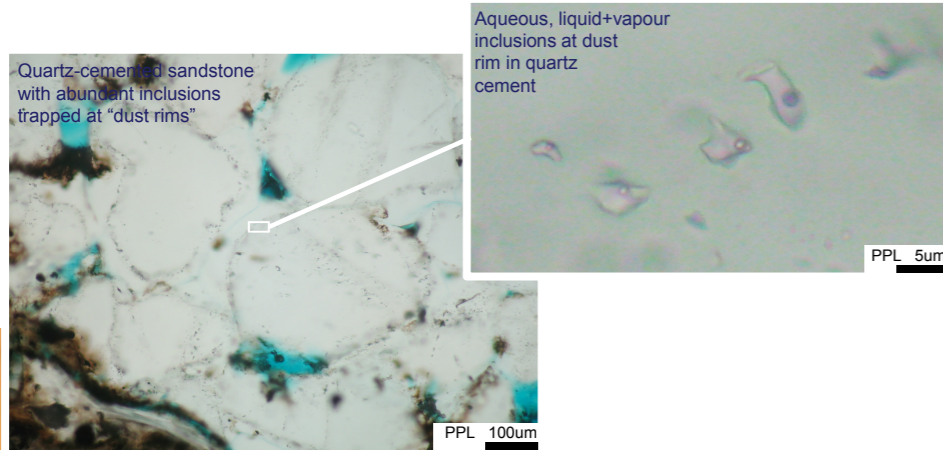


# Fluid Inclusion Analysis



## Definition

Microscopic entrapments of fluid (vapor or liquid) and occasionally minerals, that are considered to represent the chemical and physical properties of a geological fluid at a single point in time and space...

## Petrography / Screening

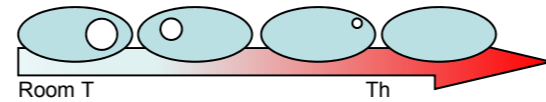
- Identification of inclusion populations and distributions
- Relationships of inclusions relative to diagenetic (and detrital) phases
- UV epifluorescence used to identify and differentiate different hydrocarbons
- identification of post-formational effects that may impact on interpretation of results (leakage, necking etc.)
- Identification of the most prospective regions of the sample for more detailed, microthermometric analysis

## Microthermometric Analysis

The temperatures at which various phase changes occur in the fluid inclusion are measured using a heating-freezing stage attached to an optical microscope.

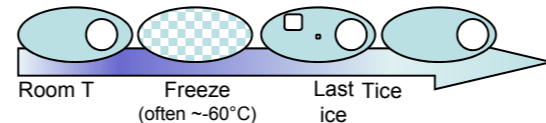
**Most commonly:**

### Homogenisation Temperatures ( $T_h$ )



Provides an minimum estimate of trapping temperature (subject to pressure correction)

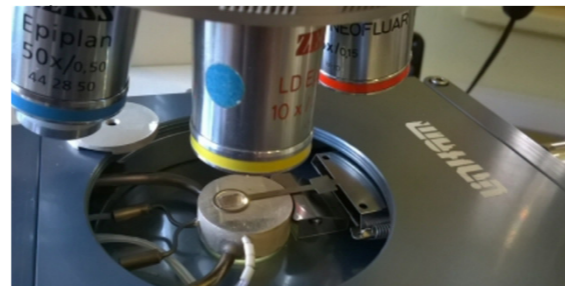
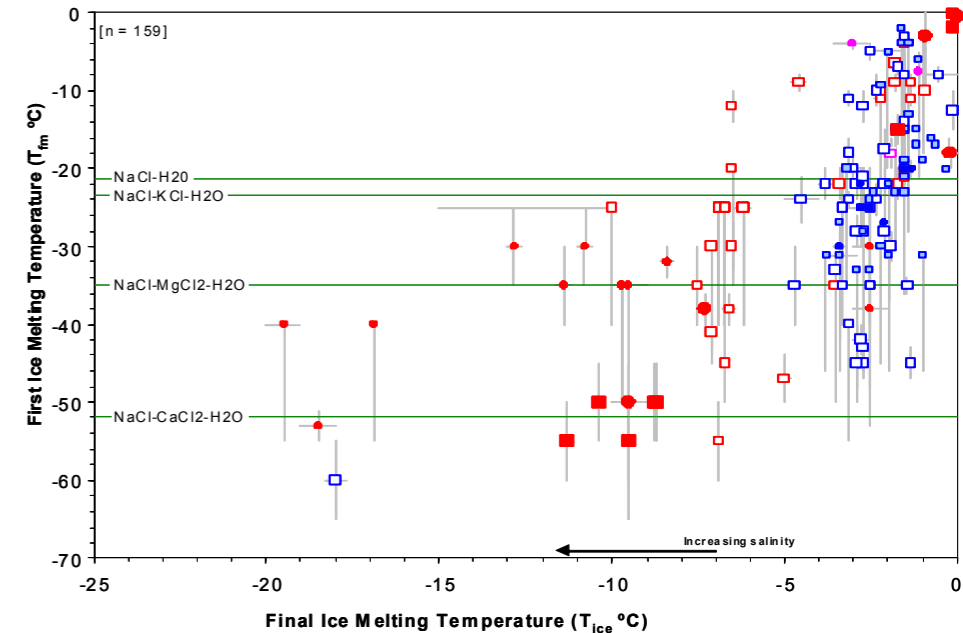
### Ice Melting Temperatures



- \* **First ice melting ( $T_{fm}$ )**  
Provides information on salts present (e.g. NaCl and/or  $CaCl_2$ )
- \* **Final ice melting ( $T_{ice}$ )**  
Provides an indication of salinity  
When coupled with temperatures of other phase changes (e.g.  $T_{fm}$  and  $T_{hydratemelting}$ ) can be used to provide more detailed models of fluid compositions

## Outputs / Applications

- Constraints on temperature and fluid compositions during cementation (e.g. recognition of meteoric vs seawater vs brine)
- Constraints on thermal and fluid chemical evolution of system (if multiple generations / cements can be analysed)
- Insight into charge history and relationship to diagenesis (by investigating the relations between hydrocarbon and aqueous inclusions and minerals).
- Temperature constraints for stable isotope data interpretation
- Refined burial / charge history models (or, if burial history is already well established, absolute dates for cementation)
- If an independent measure of precipitation temperature is available, then fluid inclusion data can be used to derive information on reservoir pressure during cementation



### Instrumentation (in-house)

- \* Linkam Scientific THMSG600 heating freezing stage (temperature range -196-600°C)
- \* Computer-controlled temperature programmer – enables "cycling" protocol to gradually approach temperature of a phase change.
- \* High quality Zeiss Axioskop microscope for optimum imaging during analysis

Co-existing (but necked) monophasic (aqueous, liquid-only) and 3-phase (vapour + blue fluorescent oil + water) inclusions trapped in calcite vein in micritic limestone

PPL +UV 5um