

Fluid Inclusion Petrography and Microthermometry

Obtain origin and history of hydrocarbons from a thin section of rock material

APPLICATIONS

- Fluid inclusion petrography
 - Microscopic examination of rock material for trapped hydrocarbons and aqueous fluids
 - Characterization of the distribution, abundance, and attributes of encapsulated fluids
 - Evidence for petroleum migration and paleo accumulations
- Fluid inclusion microthermometry
 - Evaluation of physical properties of fluids with a heating and cooling stage
 - Homogenization temperature of aqueous and petroleum inclusions
 - Determination of API gravity using a proprietary technique
 - Salinity of aqueous inclusions

BENEFITS

- Improved understanding of diagenetic history and subsurface fluid evolution
- Identification of migration and paleo accumulations in the absence of conventional shows
- Refined evaluation of porosity and reservoir quality evolution
- Complete assessment of petroleum migration history
- Input for thermal and tectonic evolution models and burial history
- Quantitative data from pristine reservoir fluids
- Potential to recognize and evaluate multiple charges and timing

FEATURES

- Only a small amount of rock material required
- Ability to use cuttings, core, or outcrop samples of any age
- Unaffected by drilling mud
- Standardized analytical methods
- Interpretive framework based on 25 years of global experience
- Centralized technical and domain support from leading geochemists

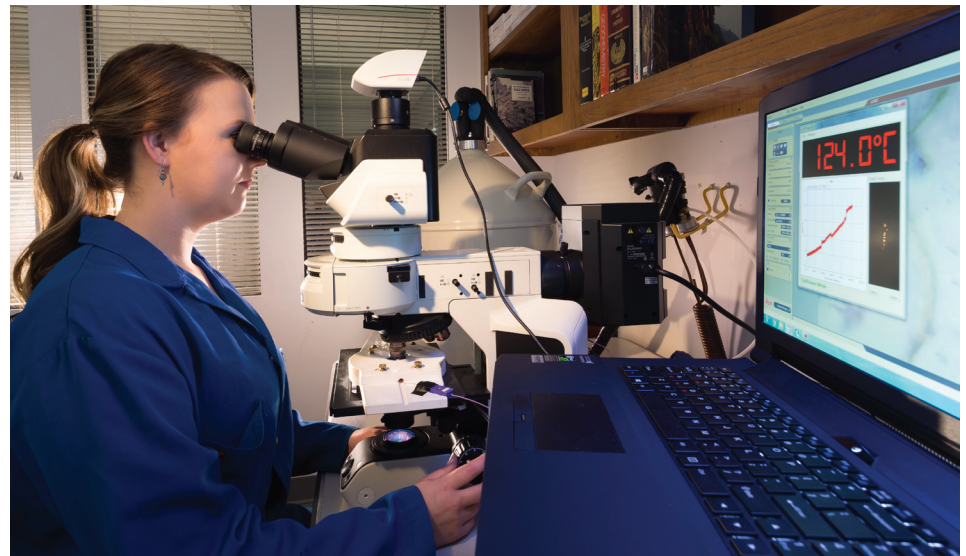
Fluids migration across the earth's strata is a complex process. As hydrocarbons and water move through the subsurface, trace quantities are left behind within micron- to submicron-scale isolated cavities. These fluid inclusions form during diagenetic events whereby cement is added to open porosity, or during which compacted or tectonic fractures are created and sealed. Despite the small size, fluid inclusions contain a wealth of useful information because they retain certain physical properties of the original fluid, such as hydrocarbon composition, bulk density, brine salinity, GOR, and API gravity.

By studying these fluids, explorationists have an opportunity to study the past, collecting fundamental data on ancient or recent fluids that cannot be generated by any other means. These data are often critical for accurate and complete assessment of the processes that govern petroleum systems and that affect the economic potential of reservoirs.

Fluid inclusion petrography and microthermometry are applicable to any lithology and any age reservoir—provided suitable fluid inclusion populations can be found. Drilling fluids do not impact the analyses, and there is no shelf life for old samples. Data are routinely integrated into petrologic evaluations, basin modeling studies, and advanced show analysis.

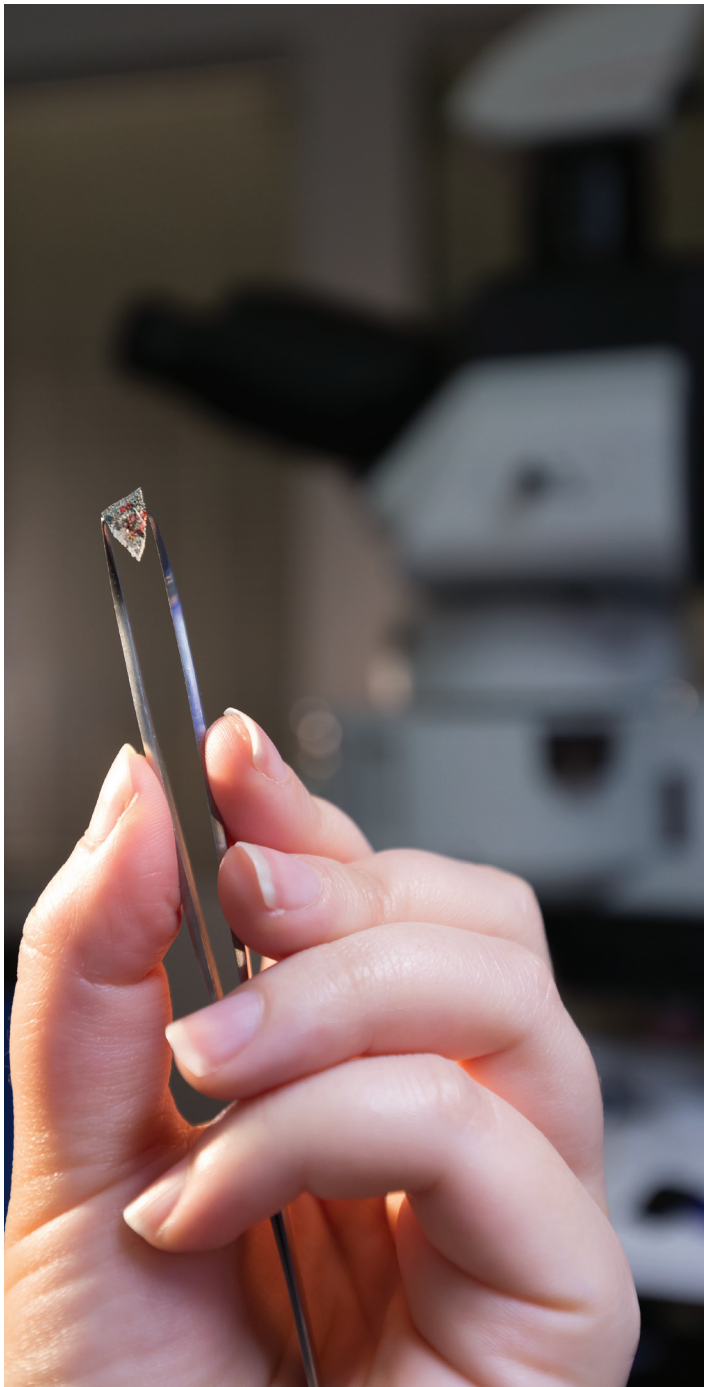
Fluid inclusion petrography

Fluid inclusion petrography is determined using thick, polished sections of rock material under transmitted plane-polarized light and episcopic illumination with a high-intensity UV source. Petroleum and aqueous inclusion populations are identified along with relevant variables, such as fluorescence color, distribution, and abundance. Optically determined petroleum inclusion abundance in conventional reservoirs is the result of reservoir quality, hydrocarbon saturation, and residence time. Thus, migration paths can often be distinguished from paleo accumulations based on the visual distribution of liquid petroleum inclusions. In unconventional, self-sourced reservoirs, inclusion characteristics often reflect the maturity and effectiveness of the local organic matter for generating petroleum fluids.



Analysis of fluid inclusions requires specialized microscope equipment and operators with years of experience.

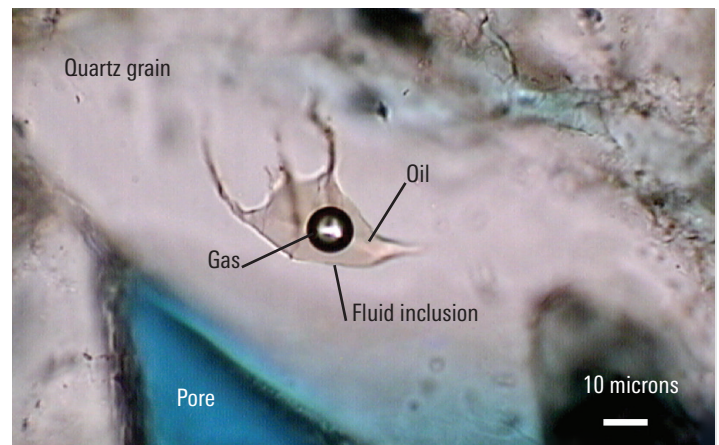
Fluid Inclusion Petrography and Microthermometry



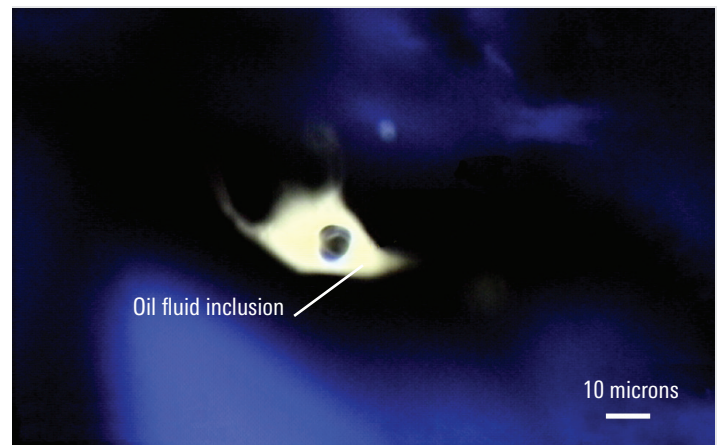
Polished sandstone rock fragment used for fluids inclusion microthermometry.

Fluid inclusion microthermometry

Fluid inclusion microthermometry is performed through advanced quantification of aqueous and petroleum fluid inclusions using a specially designed temperature-controlled chamber attached to a petrographic microscope. Phase changes and other observations within individual fluid inclusions are recorded and compared with appropriate phase diagrams or calibration curves to derive desired data, such as temperature, salinity, and API gravity. Temperatures can be related to petroleum emplacement, cementation events, or maximum thermal exposure. The proximity to bubblepoint or dew point at trapping can be evaluated, and API gravity can be estimated to within 2 degrees. Salinities are used to infer fluid sources (which can be related to regional plumbing systems) and used to evaluate the composition of irreducible water within reservoirs for calculations of water saturation.



An oil and gas fluid inclusion in a sandstone thin section.



An oil and gas fluid inclusion in a sandstone thin section under UV light.

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