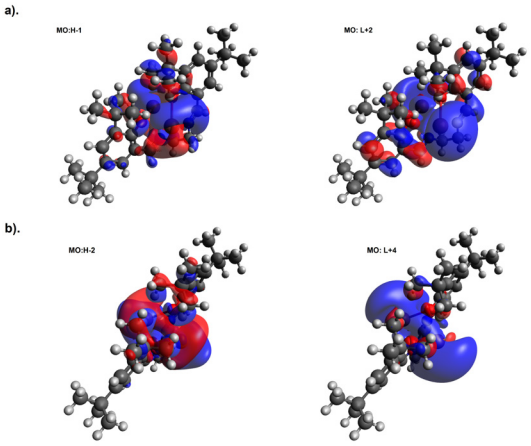
FLUORESCENT THALLIUM TRACERS

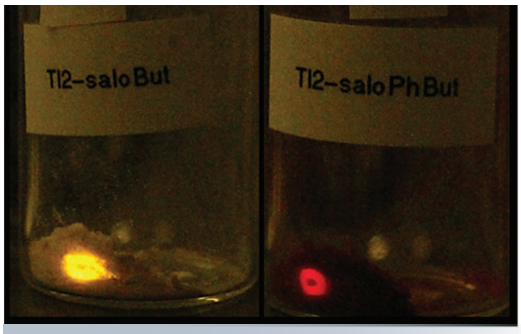
Patent Pending
Technology Readiness Level: 3/4
Key elements demonstrated in a laboratory environment

The ability to track underground fluid flows in oil and geothermal wells is critical to allow operators to extract energy as efficiently as possible. This information will allow operators to focus on areas of known production rather than low or non-generating regions. There are many tracers that are currently used in combination with proppants, however they suffer from a variety of limitations— in particular the short lifespan limits the ability to monitor productivity past initial fluid flows. Sandia National Laboratories developed a tracer that is easily detectable and designed to withstand the harsh downhole environment that can be encapsulated in known coatings for time release to slowly liberate the tracer over an extended period of time.



Molecular orbitals (MO) diagrams indicating Tl–Tl interactions for (a) H_2-salo-Bu^t (H−1 and L+2) and (b) H_2-saloPh-Bu^t (H−2 and L+4). Atom colors: Tl (brown), O (red), N (blue), C (grey), H (white).

Sandia's tracer uses a thallium salen complex tag, which is then intercalated into a proppant. The Tl-salen tag is eventually released in to the bulk underground reservoir and up to the wellhead for routine sampling. These Tl compounds are easily detectable using simple hand-held laser excitation due to the tracer's intense luminosity, eliminating the need for specialized monitoring equipment. The Tl-salen tag can be used with other metal-salen tracers to target and monitor different areas of a well. Sandia's Tl-salen tag was designed for the harsh environments of deep underground wells and will remain stable at high temperature and pressures and has proven to be highly fluorescent at low concentrations. It also exhibits low adhesion or absorption to underground materials. The Tl-tag will enable more efficient and productive well creation by offering longer term monitoring capability of underground fluid flows.



Demonstrated fluorescence using a handheld 405 nm laser pointer as excitation source.

TECHNICAL BENEFITS

- Stable at high temperatures and pressures
- High luminosity at low concentrations
- Low adhesion or absorption to underground materials
- Easily detectable with standard analytical tools
- Enables analysis to maximize energy production from wells

INDUSTRIES & APPLICATIONS

- Oil and gas production
- Geothermal energy production
- Fluid monitoring in industrial settings (power plants, chemical plants)

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