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Licensable Technologies

Microseismic Tracer Particles for Hydraulic Fracturing

Applications:

- Oil and gas production
- Geophysical exploration

Benefits:

- Tracks the disposition of material in a hydraulic fracturing operation
- Accurate delineation of the extent of the productive propped hydraulic fracture
- Detection and delineation of the extend of the fracture complexity (deviation of fracture network to planar shape)
- Low cost
- Complements existing methods

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Summary:

The trend toward production of hydrocarbons from unconventional reservoirs (tight gas, shale oil/gas) has caused a large increase in the use of hydraulic fracture stimulation of these inherently low permeability reservoir rocks. Operators and service companies require data that can be used to estimate the location and extent of the hydraulically induced fracture.

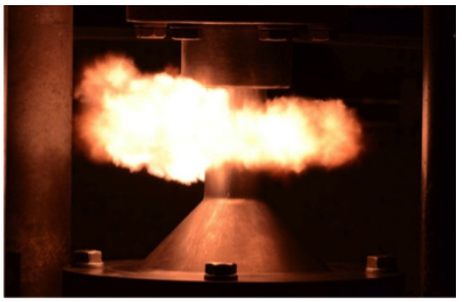

Figure 1: A graph of ionic conductivity as a function of temperature for the anti-perovskite Li_3OCl.

These parameters are frequently estimated using microseismic detection and location methods. However, the microseismic events associated with the hydraulic fracture treatment fail to resolve the productive portion of the hydraulically induced fracture. This is because the microseismic events are not limited in extent to the portion of the fracture that contains the proppant material (i.e. frac sand or other types of high strength proppant material). Microseismic events are generated along the entire extent of the fracture and possibly also in adjacent rock where the hydraulic fracture fluid has locally raised the formation pore fluid pressure sufficiently so that formation geo-stress is overcome and rock rupture or slippage can occur.

Only the portion of the hydraulic fracture that contains proppant can be expected to remain open or propped with a significant aperture or width once the hydraulic fracture fluids are flowed back to the surface and the pressure within the fracture is reduced. This pressure reduction allows the geo-stress to close the fracture where it does not contain a proppant material. The closed and unpropped fracture is then non-conductive to the flow of oil or gas and these fluids cannot reach the wellbore to be produced to the surface.

Therefore, it is desirable to discriminate between microseismic events that occur in places where the fracture contains proppant material and those that do not. Scientists at Los Alamos National Laboratory have developed a method by which microseismic events can be discriminated/detected that correspond to only the portion of the hydraulic fracture that contains the proppant material and can be expected to be conductive to the flow of oil and gas.

Development Stage:

Technology Readiness Level: 3- Component prototypes built and proof-of-concept testing completed

Patent Status:

Title:	ID Number:	Patent/Appl. Number:	Date:
Composition and Method for Locating Productive Rock Fractures for Fluid Flow	S-121,995	US Non-Provisional Patent Application No. 13/617,279	9/14/2012

Licensing Status:

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