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Chemically Induced Micro-Seismicity for Characterization of Subsurface Fracture Flow Paths:

Active particle swarms can travel through small rock holes to produce detectable chemically induced vibrations, offering a safer and more efficient method to enhance subsurface fracture visibility for oil recovery, geothermal production, and sequestration operations.

Oil and gas companies, along with others interested in studying the geology below ground, need accurate ways to detect subsurface features. Subsurface engineers must find the fractures and fracture networks that affect fluid extraction, sequestration, and other fluid movement through the subsurface. The current methods used to illuminate subsurface fractures either use physical sensors that do not move through small holes within the rocks or record vibrations produced upon induced damage in the rock. Such induced damage may occur too far from a sensor to produce an accurate signal. The amount of information available for very small cracks in the rock is limited when using current techniques.

Researchers at Purdue University have developed a new way to locate subsurface fractures in rocks that promises greater accuracy. This new technology uses active particle swarms that travel through small holes in the rock. These particles produce a chemically induced vibration that can be detected from the surface. Subsurface engineers using this method will detect more small fractures and can employ this wealth of data to conduct their operations in a more environmentally conscious manner. Further, the method makes characterization of fractures in the rock more efficient, because the active particles swarms travel farther and deeper than other methods. This new technology will be valuable to enhance oil recovery, geothermal production, and subsurface sequestration.

Advantages:

-Safer

-More efficient

Technology ID

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Category

Energy & Power Systems/Power Generation

GreenTech/Environmental Remediation & Pollution Control

Authors

David Nolte

Nicholas Nolte

Laura J Pyrak-Nolte

Further information

Aaron Taggart

adtaggart@prf.org

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-Enhance visibility of fractures in rock below earth's surface

Potential Applications:

-Oil recovery

-Geothermal production

-Subsurface sequestration

TRL: 3

Intellectual Property:

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Keywords: subsurface features detection, subsurface fractures, fluid extraction, active particle swarms, chemically induced vibration, enhanced oil recovery, geothermal production, subsurface sequestration, fracture characterization, subsurface engineers