

Stable Particle Compositions and Methods Related Thereto

Technology #17159

Applications

This invention has applications for a variety of surveying and mapping activities in the petroleum industry.

Problem Addressed

Nanoreporters are a class of nanoparticles containing a solid core material which is released in the presence of oil. They are used in the petroleum industry for hydrocarbon discovery. An aqueous suspension of nanoreporters is injected into the subsurface before being recovered and analyzed for released core material.

Existing nanoreporters rely on polyelectrolytes attached to their surfaces to keep them suspended in the aqueous medium. However, these polyelectrolytes are poorly solvated at high salinity and are susceptible to breakdown at elevated temperatures, compromising the colloidal stability of existing nanoreporters under conditions commonly encountered in oil reservoirs.

Technology

This invention provides a class of nanoreporter particles stabilized by surface-bound polyampholytes. Polyampholytes are ionic polymers containing both anionic and cationic groups, unlike polyelectrolytes which contain either one or the other. This diversity of ionizable groups allows polyampholytes to maintain some degree of charge across a wide range of salinity and pH. When dispersed in water, the like-charged polyampholyte-coated nanoreporters electrostatically repel one another and resist aggregation, thereby stabilizing the suspension.

In tests using both synthetic and natural reservoir brines, the novel nanoparticles described in this invention have achieved long-term colloidal stability at salinities as high as 120,000 mg/dm³ and temperatures as high as 90 °C -- roughly twice the stability limit previously achieved.

Advantages

- Resistant to thermal decomposition
- Maintains colloidal stability over a wide range of salinity and pH
- Compatible with wide variety of payloads for diverse mapping and exploration applications

Categories For This Invention:

Chemicals

Energy

Hydrocarbons

Oil Exploration

Intellectual Property:

Stable polymeric nanoparticle compositions and methods related to thereto

US Patent Pending

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Publications:

Responsive Stabilization of Nanoparticles for Extreme Salinity and High-Temperature Reservoir Applications

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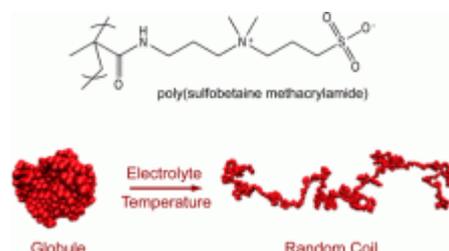
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