Hydrate-phobic Pipe Surfaces

Technology #14446

Applications

Hydrate-phobic surfaces can be used in pipes and fittings for deep-sea oil and gas exploration.

Problem Addressed

Current methods for hydrate mitigation are expensive, energy intensive, and environmentally unfriendly, focusing on the use of chemicals to shift the equilibrium hydrate formation curve to higher pressures and lower temperatures, using kinetic inhibitors to slow the growth of hydrates, heating the pipe walls, or managing the flow of formed hydrates. This technology creates a surface that prevents the adhesion and coagulation of hydrates by reducing the surface energy.

Technology

Van der Waals forces, hydrogen bonding (Lewis acid/ Lewis base interaction), and surface texture effect the interaction of hydrates and surfaces. Therefore, by creating low-surface energy coatings hydrate adhesion can be mitigated. Low-surface energy is achieved with specific lattice parameters that induce a lattice mismatch with the hydrate layer and inhibit adhesion of the hydrate to the surface. Reducing hydrate adhesion prevents hydrate nucleation, which creates hydrate build ups and plugs.

Advantages

- Reduces hydrate adhesion in oil and gas pipes
- Cost effective hydrate mitigation techniques

Categories For This Invention:

Energy
Hydrocarbons
Oil Exploration

Intellectual Property:

Articles and methods for reducing hydration adhesion
Issued US Patent

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Publications:

Hydrate-phobic Surfaces: Fundamental Studies in Clathrate Hydrate Adhesion Reduction
Physical Chemistry Chemical Physics
2012,14, 6013-6020
New Method to Prevent Undersea Ice Clogs
MIT News
April 12th, 2012

External Links:

Varanasi Group
http://varanasi.mit.edu/
Cohen Group
http://cohengroup.mit.edu/
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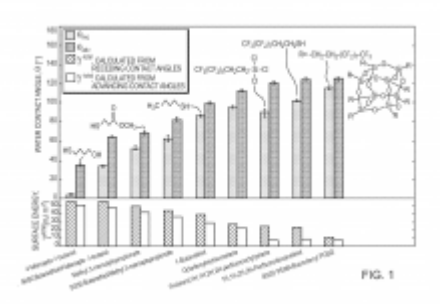
http://web.mit.edu/nnf/

Image Gallery:



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