

Scooping out oil spills made easy by IISER Thiruvananthapuram

Quick removal “It takes only from 30 minutes to two hours from the time of application to scooping out the rigid fibre balls containing congealed oil,” says Kana Sureshan (right)

More efficient and quick absorption of crude oil from the sea following marine spill has now become possible thanks to scientists from the Indian Institute of Science, Education and Research (IISER) in Thiruvananthapuram who have developed a hydrophobic sorbent that can suck up oil and congeal it. A hydrophobic material automatically becomes oil-loving and takes up oil when it comes in contact with it. The results were published in the journal *Angewandte Chemie*.

Hydrophobic sorbent

A two-member research team led by Prof. Kana M. Sureshan from the School of Chemistry at IISER developed the hydrophobic sorbent by using a cheap raw material (mannitol) and cellulose pulp as a matrix. Mannitol was converted into a hydrophobic gelator through a one-step process and a solution was made using this compound. Cellulose balls the size of marbles were then dipped in the solution and dried.

“The gelator gets adsorbed on the cellulose fibre through hydrogen bonding. This process of adsorption of gelator on the cellulose fibre matrix changes the cellulose matrix from being very hydrophilic (water-loving) to hydrophobic (water repelling),” says Prof. Sureshan. A hydrophobic material naturally becomes oleophilic (oil-loving).

Unlike other alternatives, the sorbent can be easily applied over oil-water mixture, and no solvent is needed for spraying the gelator thus making it environmental benign. The gelator adsorbed on the surface of cellulose fibre is able to absorb oil when it comes in contact with it.

“Once the sorbent sucks the oil, the gelator slowly gets released from the cellulose fibre and congealing of oil takes place,” Prof. Sureshan says. Only when the oil congeals can it be removed without the oil dripping due to gravity.

Congealing of oil becomes possible as the gelator used by the team self-assembles to form micro fibres and the oil loses its fluidity and gets trapped within the entangled fibrous network to form a rigid gel. Gelation essentially turns the liquid oil phase into a semi-solid one and this allows the fibre balls with the congealed oil to be simply scooped out or removed using a scoop or a sieve.

“It takes only about 30 minutes to two hours from the time of application to scooping out the rigid fibre balls containing congealed oil, leaving behind clean water. Since crude oil spreads quickly in the sea after a spill, it is necessary to quickly remove the oil from water,” Prof. Sureshan says.

The team tested the ability of their sorbent to congeal oil using six different crude oils, including the one from Bombay High.

Irrespective of the different viscosities of the six crude oils tested, the sorbent was able to absorb the oil and the rigid globules could be scooped out in 30 minutes to two hours.

Studies found that the sorbent was able to absorb and congeal 16 times its own weight of oil. The absorbed oil can be recovered by applying pressure or fractionated by a simple distillation process.

A study of nearly 300 people living in different parts of India found that nine single-base variants

(single-nucleotide polymorphisms or SNPs) account

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