



# Super-Hydrophobic Cotton Composite for Oil Spills

## Why in News

Recently, the **Indian Institute of Technology (IIT), Guwahati**, has developed a **super-hydrophobic cotton composite** with **Metal-Organic Framework (MOF)** that can clean-up marine [oil-spill](#).

- Earlier, a study confirmed that **Stimulating Bacteria (Bioremediation)** with nutrients in the cold seawaters of the Canadian Arctic can help decompose diesel and [Other Petroleum Oil](#) **after Oil Spills**.

## Key Points

### ▪ About:

- It is a **novel MOF composite, which is a highly porous and water-repellent material** and can absorb oil selectively from an oil-water mixture.
  - MOF are **crystalline porous solids** composed of a three-dimensional (3D) network of metal ions held in place by multidentate organic molecules **suitable for solid-phase extraction**.
- This MOF composite has **great capability for selective separation of the oils from oil/water mixtures** and the separation efficiency lies between 95% and 98%, irrespective of the chemical composition and density of the oils.
- It can also absorb **large volumes of oils and can be reused for a minimum of 10 times** so that the sorbents can provide more recovery of the spilled oil. Both heavy and light oils can be effectively absorbed by the material, which is easy to prepare, cost-effective and recyclable.

### ▪ Significance:

- It will **clean-up the spilled oil from environmental water** (river, sea or ocean water) during oil transportation with high efficiency and large absorption capacity, thus reducing environmental water pollution.
- It is **environmentally friendly and cost effective**. Such low-cost material will reduce the production cost of the material for large-scale synthesis for real applications, compared to currently available materials.

### ▪ Other Remedies for Oil Spills:



### 1 SHORELINE FLUSHING/WASHING

Water hoses can rinse oil from the shoreline into the water, where it can be more easily collected.

### 2 BOOMS

Long, floating, interconnected barriers are used to minimize the spread of spilled oil.

### 3 VACUUMS

Industrial-sized vacuum trucks can suction oil from the shoreline or on the water surface.

### 4 SORBENTS

Specialized absorbent materials act like a sponge to pick up oil but not water.

### 5 SHORELINE CLEANERS & BIODEGRADATION AGENTS

Chemical cleaners that act like soaps may be used to remove oil, but require special permission. Nutrients may be added to help microbes break down oil.

### 6 BURNING

Also referred to as "in situ burning," freshly spilled oil can be set on fire, usually while it's floating on the water surface and sometimes on oiled marsh vegetation, in order to effectively remove it.

### 7 MANUAL REMOVAL

Cleanup crews using shovels or other hand tools can pick up oil from the shoreline. This method is used especially when heavy machinery cannot reach an oiled shore.

### 8 MECHANICAL REMOVAL

When there is access, heavy machinery, such as backhoes or front-end loaders, may be used.

## Oil Spills

### ▪ About:

- It refers to **any uncontrolled release of crude oil, gasoline, fuels, or other oil by-products** into the environment. It can pollute land, air, or water, though it is mostly used for oceanic oil spills.
- The severe water contamination threatens the health of humans as well as other living species.
- It has become a major environmental and economic problem, chiefly **as a result of intensified petroleum exploration and production on continental shelves** and the

transport of large amounts of oils in vessels.

- **Major oil spills** are frequently followed by the **immediate suspension of commercial fishing** and also affect **tourism and commerce** through sea routes.
- Oil spills that happen in rivers, bays and the ocean most often are caused by accidents **involving tankers, barges, pipelines, refineries, drilling rigs and storage facilities**, but also occur from recreational boats and natural disasters.
- **Related Laws in India:**
  - Presently, **there is no law covering oil spill** as such and its consequential environmental damage in India but India has “**the National Oil Spill Disaster Contingency Plan of 1996 (NOS-DCP)**” to handle such situations.
    - It gives the **Indian Coast Guard** the mandate to coordinate with state departments, ministries, port authorities and environmental agencies to assist in oil spill cleaning operations.
  - In 2015 India ratified the **International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001** (Bunker Convention). Convention ensures adequate, prompt and effective compensation for damage caused by oil spills.
    - It was administered by the [International Maritime Organization \(IMO\)](#).

**[Source: DTE](#)**

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