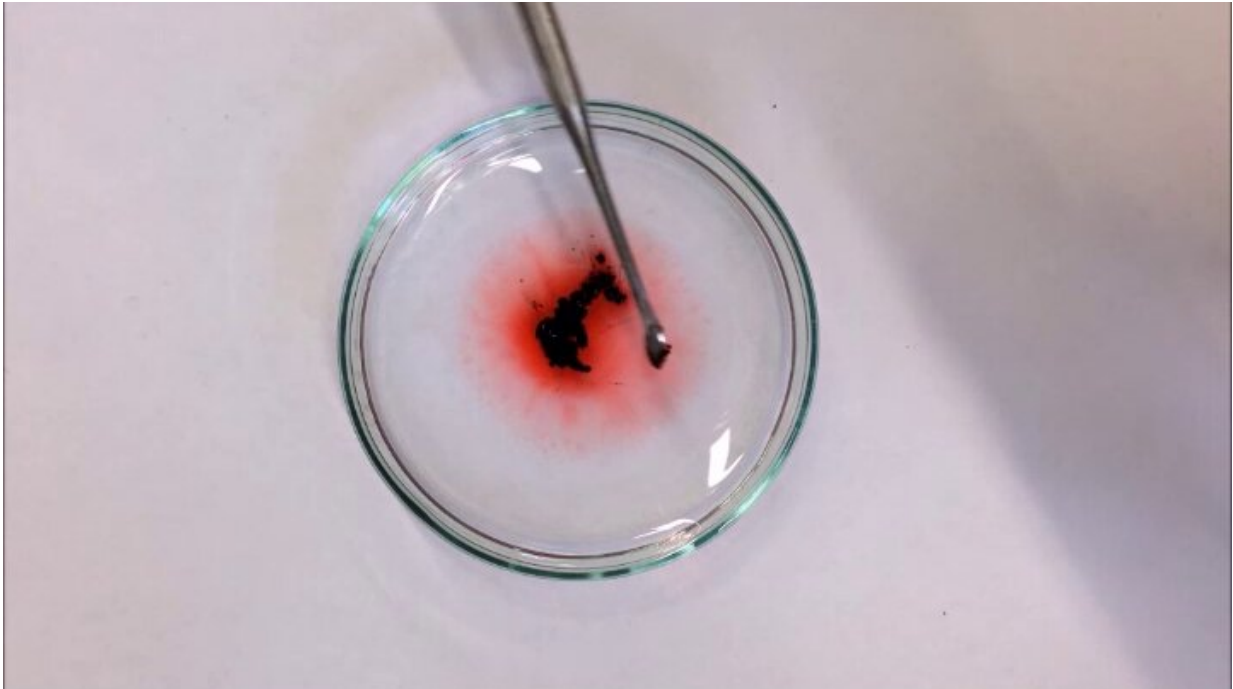


Cleaning up oil using magnets

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The hydrocarbons, such as crude oil or diesel dyed red in this case. Credit: FAU/Luis Portilla

In the future, it could be possible to remove oil spills on the surface of the ocean by using magnets. An interdisciplinary group of researchers at Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU) led by Prof. Dr. Marcus Halik has developed functionalised iron oxide particles that can attract any types of hydrocarbons. The magnetic particles and their shells can then be removed from the water relatively simply and in an

environmentally-friendly manner and can even be reused after being cleaned.

The researchers have now published their study in the renowned journal *Advanced Functional Materials*. In the study, they describe how functionalised iron oxide [particles](#) can be modified with a self-assembled monolayer so that they only adsorb hydrocarbons. This group of chemical substances includes light compounds such as alkanes and aromates but also crude oil, petrol and diesel. Such [hydrocarbon](#) molecules surround the very [fine particles](#) as if they are being sucked in and reach a volume that can grow to 14 times the size of the core of the particle. A video on the researchers' website shows how [iron oxide](#) powder is applied to liquid oil and the instant transformation into a substance that can be removed by a magnet. Iron oxide is a magnetic substance by nature.

In addition to the multiple reusability of the source material, the large surface to volume ratio provided by nanoparticles and the favourable ratio to the quantity of the hydrocarbons to be adsorbed all contribute to the very high efficiency of the process. In addition, it allows water to be completely cleaned of oil and oil products. Conventional methods, on the other hand, create dispersions or mixtures of substances that enable the hydrocarbons to be more easily digested by bacteria, but remain in the seawater until this process is complete.

In addition to manufacturing and characterising the particles, the research involved experiments using various hydrocarbons and different sources of water at [different temperatures](#) supplemented by molecular simulations that enabled the materials to be improved further.

In future, the system could help to considerably reduce the impact of contamination by oil on the environment. The FAU researchers are currently working with partners in industry to scale up the manufacturing

of the materials and to transfer the concept to real applications in clean up operations.

More information: Marco Sarcletti et al. Superoleophilic Magnetic Iron Oxide Nanoparticles for Effective Hydrocarbon Removal from Water, *Advanced Functional Materials* (2019). [DOI: 10.1002/adfm.201805742](https://doi.org/10.1002/adfm.201805742)

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