Magnetizing Oil: A New Paradigm for Cleaning Up Aquatic Oil Spills

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In 2023, more than 10,000 oil spills caused approximately 706 million gallons of oil to be spilled into the ocean, damaging the environment and costing billions of dollars in mitigation efforts. Magnetizing oil using ferrofluid is an efficient method for removing oil from the ocean while minimizing additional environmental harm. Ferrofluid is a colloidal liquid made up of nanoparticles that exhibit a strong magnetic response when subjected to a magnetic field. This study assessed the efficacy of ferrofluid in magnetizing oil to clean up aquatic spills under various temperatures and salinity conditions. The first hypothesis is that, if ferromagnetic nanoparticles are used to separate oil from water, then more than 50% of the oil, on average, will be successfully magnetized and extracted from the solution. This hypothesis was not supported; more than 40% of all three oils used were efficiently and successfully extracted from each water solution. The second is that if ferromagnetic nanoparticles are exposed to high salinities, then they will be less effective in magnetizing the oil since salt will weaken the water's magnetic field. The third is that if ferromagnetic nanoparticles are exposed to higher temperatures, then they will be less effective in magnetizing the oils since magnetic forces are weaker at higher temperatures. The efficacy of the ferrofluid in different water salinities and temperatures depended on the type of oil it was tested in. With the integration of this research conducted on the use of ferrofluid, with the novel method invented in this project to implement the use of this research on a larger scale, outside of controlled conditions, environmentalists may now consider the use of ferrofluid in order to reduce the large amounts of oil in the ocean.

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