Slick and Clean: An Investigation Into How Magnetite Can Be Used with Organic Sorbents in Oil Spill Clean-Up

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This investigation was a response to the devastating impacts of oil spills on marine ecosystems, and further, the lack of effective modern technologies available in the remediation process. This study strove for an innovative solution to this issue, through the application of magnetism to enhance the effectiveness of hydrophobic oil-adsorbent organic waste matter (straw, human hair, feathers). This involved the use of magnetite (Fe_3O_4), the naturally abundant ferromagnetic iron oxide, which was sourced using a simple magnet at a local Sydney beach. A boom-like prototype was developed. It contained neodymium magnets, and was coated in a fixed mass of an organic sorbent material. Magnetite was dispersed over the surface of an oil-water mixture in the ratio 1:40. When the magnetic boom was passed across the surface of the mixture at a constant rate, the oil bonded with the magnetite and was rapidly drawn towards the boom, effectively removing the oil from water. It was found that the combination of magnetite enhanced the retrieval of oil. Strikingly, the most effective adsorbent waste material was feathers, which collected 14.89 times its mass in oil with the application of magnetite. This is likely due to the biological function of feathers in the protection and insulation of birds. Magnetite, as a natural feature of depositional landforms worldwide, poses a minimal threat to aquatic ecosystems if used on a large scale. Thus, these findings support the potential application of magnetite in conjunction with organic sorbent materials as an environmentally friendly, efficient and practical clean-up solution.

Awards Won:

Third Award of $1,000