Oil Absorption Abilities of Superhydrophobic Salvinia molesta: Potential for Crude Oil Spill Clean-up

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A promising solution to the issue of oil spill pollution are biological surfaces with superhydrophobic properties, which enable oil to be absorbed and removed. The water fern, Salvinia molesta, is superhydrophobic and superoleophilic, its properties being naturally suited to the removal of oil without any malignant effects on the environment. In this study, the effect of these trichomes upon the possible oil absorption abilities to clean up oil spills of Salvinia molesta was derived from the leaves' oil absorption when in contact with oil. Some leaves were observed using a Scanning Electron Microscope (SEM) and dried using the critical point dryer (CPD) process. This enabled images to be taken of the leave's trichomes which provide the plant with its superoleophilic and superhydrophobic properties and allowed for calculation of the contact angle, which denotes the hydrophobicity of surfaces. During the experiment, the leaves were placed in different oils and the impact of varying viscosities and densities of oils were measured and investigated in the study. A leaf with damaged trichomes was also used as a comparison to show the importance of the trichome structures. The study found that the physical properties of the oil affect the oil absorption capacity and the Salvinia molesta leaves are shown to absorb oil within 30 seconds, without the subsequent absorption of water. The oil absorption of the trichomes is dependent on not only the height but the structure of the fused egg-beater shaped trichome tips which are in contact with the oil, supporting the oil/water interface and providing a larger surface area for oil absorption. The Salvinia molesta leaves are hydrophobic due to their contact angle, explaining their property of repelling water while absorbing oil.

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