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Recent advances in fabrication of superhydrophobic and oleophilic membranes for oil-water separation using Polystyrene coating

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In recent years, wastewater that contains oil has become a greater threat to the environment due to the human activities. Therefore, development of an effective method for separating oil and water from oily wastewater has received a greater attention. Conventional separation techniques such as floating, coagulation, sedimentation, oil skimmers, biodegradation, are costly and rather inefficient as they do not prevent oil diffusion. Recently, with the development of nanoscience and surface chemistry, surfaces with selective wettability like hydrophilic-oleophobic or oleophilic-hydrophobic, have provided a new method for oily wastewater treatment. Compared to conventional methods, filters with selective wettability are low in cost, more effective and easy to fabricate. Wettability nature of a solid surface by a liquid can be characterized by the contact angle, and the major factors that are responsible for the wettability of a surface are the surface energy and the surface roughness. By controlling these two factors, membranes with desirable properties can be fabricated. In order to fabricate a surface with hydrophobic properties, a material with low surface energy, such as surfactants, silanes, polymers have been used in previous studies and for increasing the surface roughness nano rods, nano fibers, nanoparticles- like structures have been prepared. Despite much progress has been achieved, the fabrication of a low cost and durable membrane with a high flux is still a promising challenge. Recently TiO_2-Polystyrene Nanofibers with a water contact angle of 149.77° have been prepared, and membranes with a flux of 6460 L m^{-2} h^{-1} and 99.5% have been reported recently. In our research, we aim to increase the water contact angle by modifying the surface roughness with higher flux and durability.

Keywords: *oil-water separation*, Superoleophilicity, *Polystyrene, Super hydrophobicity*