O 16. SANDWICH-TYPE N-OMMT CLAY INCORPORATED PVB/PAN NANOFIBROUS FUNCTIONALIZED MEMBRANE WITH HIGH OIL ABSORPTION CAPACITY

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ABSTRACT*:* Today, oil pollution in water is a major challenge due to the processes of oil being explored, stored, transported, and used in many industries. Removal or the collection of oil from water surfaces has attracted worldwide attention. With the increasing level of awareness focused on the protection of the environment, researchers have fabricated a great deal of nanomaterials as oil absorber materials to concentrate, transfer, and absorb spilled oils. Oil sorbents are very commonly used during oil spills for their cost-effectiveness and affordability. An ideal sorbent material should have high hydrophobicity, high oleophilicity, high uptake capacity and rate, adequate buoyancy, and good recoverability of the absorbed oil. A wide variety of natural materials can be used as sorbents for this purpose. However, synthetic oil absorbers are the generally most effective in removing oil. Design of synthetic oil absorber materials which have oleophilic properties and good absorption performance for removal of oil can be performed by nanotechnology based approaches like electro-spinning technique. This technique allows to fabricate non-woven fibrous mats which are widely used for oil cleanups due to their scalable production.

The main goal of this study was to fabricate a sandwich-type nanofibrous membrane with high oil absorption capacity. The membrane was created by sandwiching the nanosized organoclay (Cloisite 20A, C20A) loaded polyvinyl butyral (PVB) nanofiber mats between two layers of polyacrylonitrile (PAN) electro-spun mats like conventional membranes. Firstly, dispersion and exfoliation of C20A in ethanol were achieved by ultrasonic treatment during 30 min followed by mixing with certain amount of PVB polymer with magnetic stirrer, during 18 hours. After receiving more homogenous solution, it was transferred into the syringe, then electrospun onto PAN nanofiber mats. In the last stage of the fabrication, PAN/DMF (N,N dimethyl formamide) solution was electrospun onto PVB-organoclay mats as a top layer. This trio layer membrane has hydrophobic and oleophilic characteristics. However, the use of alcoholysis reaction was investigated in order to enhance these properties of membrane. This process made the surface of the membrane rougher than that of the non-modified membrane. Oil absorption tests of the functionalized membrane for motor oil and various oils such as sunflower oil, soybean oil and corn oil were carried out in batch tank. Oil absorption capacities were calculated in terms of weight gain. According to the results, functionalized membrane having more hydrophobic and oleophilic surface exhibited excellent oil absorption capacities. It can be reported that it has an enough stability and absorption ability for water cleanup methods within scalable production.

Keywords: *Oil absorbent, nanofibers, electro-spun*, *electro-spinning, hydrophobic, oleophilic*