S2.6.4 POLARIZED PVDF NANOFIBER MATS FOR COALESCENCE FILTRATION

Harshal Gade, George Chase
The University of Akron

Polarization of electrospun PVDF nanofiber mats and their filtration applications

Polyvinylidene Diflouride (PVDF) molecules are composed of monomer units of (CH2-CF2)n and show strong piezo, pyro and ferroelectric properties. They exist in five crystalline phases with beta-phase showing the most dipole moment owing to its orientation and making it of great interest for many potential applications. In this work, electro-spun PVDF fiber mats are polarized using electro-mechanical and thermal method. Polarization of fibers not only increase charges on fibers but also increase the fiber surface roughness and mat pore sizes.

Mat properties are compared between polarized and untreated mats. Morphological and thermal properties has been studied using characterisation instruments such as SEM, TGA, DSC, Porometer, BET, Pycnometer, Frazier test. The mats are evaluated for filtration performance for the capture of nanoscale salt particles. Polarized PVDF fiber mats have larger pores yet have higher capture efficiencies and lower pressure drops than the un-polarized fiber mats. Experiments to evaluate effects of shelf life and particle loading are in progress.

Contact angle measurements for these mats against water and salt water show that they are hydrophobic in nature. For diesel, the mats are oleophilic. Preliminary experiments have shown that these mats are good adsorbents of salt. Literature shows that un-polarized PVDF nanofiber mats have been successfully used in water desalination processes. These properties of mats are of huge potential in processes such as water-diesel filtration and water desalination techniques such as membrane distillation. Performance of un-polarized and polarized will be evaluated in in these applications in future experiments.