Through the use of electrospinning and electrospraying techniques, highly conductive polymeric membranes composed of ionic liquids, polymerized ionic liquids, and/or supporting polymers such as polyvinylidenedifluoro-co-hexafluoropropylene or polyvinyl alcohol can be deposited onto a variety of substrates. These non-woven membranes are composed of nanometer-sized fibers (Figure 1), which give the membranes significant tensile strength as well as flexibility. By varying the compositions of the electrospun materials and the substrates used, polymeric membranes possessing high ionic conductivity can be prepared and utilized for a variety of applications such as power sources and fuel cell membranes.

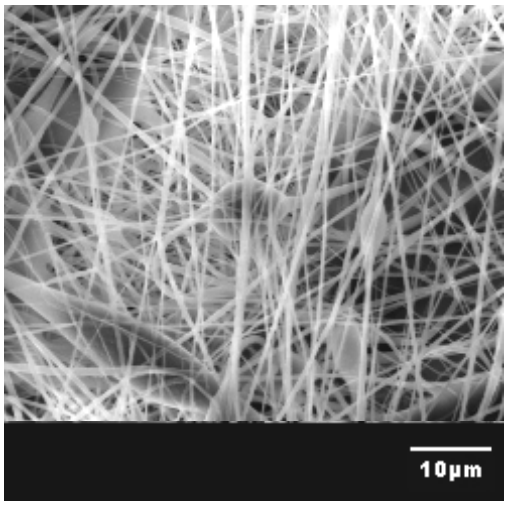

Figure 1. SEM image of an electrospun polymeric membrane.