Synthesis of Extra-long Polyaniline Nanofibers

Yue Jessica Wang, Henry D. Tran, and Richard B. Kaner

Department of Chemistry and Biochemistry, UCLA

One-dimensional (1-D) nanostructures of polyaniline are known to be important in various applications such as chemical sensors, actuators, organic memories, and photovoltaic devices. Compare to other synthetic routes to polyaniline nanofibers, the method our lab developed, the rapidly mixed method, has the advantage of producing highly uniform nanofibers with diameters less than 100nm through a simple reaction, while the disadvantage is that such nanofibers are relatively short. In our study, extra-long nanofibers of polyaniline have been synthesized through the incorporation of various aromatic additives such as benzenediamine, aniline dimer, and aniline tetramer on a catalytic scale. Such additives play the role of initiators in the reaction and serve as homogeneous nucleation sites for the growth of polymer chains, which results in the formations of extra-long nanofibers. For example, the polyaniline polymerization initiated by aniline tetramer produces nanofibers with an average length of roughly 30μm and approximately 100nm in diameter. In contrast, nanofibers synthesized through conventional methods are only a few micrometers in length with similar diameters. Being able to synthesize extra-long nanofibers through our rapidly mixed method solved its biggest disadvantage and made this method the most competitive candidate for commercializing polyaniline nanofibrous mats. Also, thin films made out of such extra-long nanofibers of polyaniline are expected to possess higher conductivity than typical nanofibers, which will enhance their performances in various electronic devices.