

# CONDUCTING POLYMER NANOFIBERS: SYNTHESIS AND APPLICATIONS

**Richard B. Kaner**

Department of Chemistry and Biochemistry, Department of Materials Science and Engineering and California NanoSystems Institute, University of California, Los Angeles

## ABSTRACT

By using either interfacial polymerization or rapidly mixing aniline, oxidant and acid, pure nanofibers of polyaniline can be produced.<sup>[1,2,3]</sup> The key to forming nanofibers is to suppress secondary growth that results in the agglomerated particles found in conventional polyaniline synthesis.<sup>[4,5]</sup> Our methods are template-free and readily scalable. Stable and processable colloids are now available.<sup>[6]</sup> The synthesis of nanofibers of polyaniline derivatives, polypyrrole and polythiophene has been accomplished by adding appropriate initiators.<sup>[7,8]</sup>

Polyaniline nanofibers exhibit an exceptional photothermal effect in which they instantaneously melt and cross-link upon exposure to a camera flash.<sup>[9]</sup> This novel flash welding technique can be used to form patterned nanofiber films, create polymer based nanocomposites and make asymmetric polymer membranes. These asymmetric structures can act as mechanical actuators (artificial muscles) when exposed to strong acids.<sup>[10]</sup> Polyaniline nanofibers are useful in many applications such as resistive-type sensors where their high surface area enable very rapid response times often less than two seconds.<sup>[11,12]</sup> Polyaniline nanofibers can be modified to respond to many different vapors including toxic agents such as hydrogen sulfide. Polyaniline nanofibers can be decorated with metal nanoparticles which not only can enhance sensor response, but also leads to molecular memory devices<sup>[13]</sup> and catalysts.<sup>[14]</sup> Nanofibers of aniline oligomers can also be synthesized in crystalline form with relatively high conductivities.<sup>[15]</sup>

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