INKJET PRINTING: A VIABLE TOOL FOR PROCESSING POLYMER CARBON NANOTUBE COMPOSITES

Marc in het Panhuis
Department of Chemistry and Intelligent Polymer Research Institute, University of Wollongong, Wollongong, Australia
panhuis@uow.edu.au

Carbon nanotubes possess unique electrical and mechanical properties that make them desirable components in a range of potential applications. However, their difficulty in processing represents one of the key challenges to researchers working in this area. Wet or solution based approaches for processing CNT involve two steps: dispersion of carbon nanotubes in common solvents using stabilizing agents, e.g. surfactants and polymers (Figure 1A-B). This is followed by techniques such as drop casting, filtration or spray painting allowing for the fabrication of nanotube containing materials with enhanced electrical, mechanical or optical properties.

Figure 1. Access the properties of carbon nanotubes (CNT). (A) As-produced CNT material, (B) image of stable CNT dispersion, and transmission electron microscopy image, and (C) inkjet processing into transparent conducting thin film (see reference 9 for full details).

A new and exciting processing method is based on inkjet deposition of water based CNT inks. Recent developments include the deposition of conducting films from single-wall carbon nanotubes (SWNT) and functionalized multi-wall carbon nanotubes (MWNT), as well as deposition of transparent water sensitive SWNT and MWNT films (Figure 1C).

In particular I will demonstrate that the unique combination of (conducting electroactive or natural) polymers with conducting carbon nanotubes has been proven to be an ideal formulation with all of the demanding characteristics needed for inkjet printing. These materials could be readily deposited onto a wide variety of substrates such as photo paper, PET, Pt-ITO and Au-PVDF. Several important characteristics, such as optical, electrical, and electrochromic behaviour will discussed in detail.

In conclusion, this presentation will discuss the development of inkjet printing as a viable tool for the fabrication of transparent conducting electroactive materials.
References: