Characterization of Conductive Polymer Inks based on PEDOT:PSS

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Abstract

The main driving force for implementation of printing in manufacture of flexible electronics is the possibility to reduce the cost by high speed R2R processing at ambient conditions. This work focuses on characterization of inks that can be used to print simple components or layers for various applications in electronics. More specifically, inks containing conductive polymer, poly(3,4-ethylenedioxy-thiophene)-poly(styrene sulfonate), known as PEDOT: PSS, were tested. In order to deposit smooth and uniform functional layers, it is important to optimize ink spreading and leveling on the substrate. PEDOT:PSS is commercially available as an aqueous dispersion with high surface tension (71 mN/m), which leads to poor ink spreading and substrate wetting. In this work, addition of alcohols and surfactants was used to lower the surface tension of polymer ink and the effect of concentration on dynamic and static surface tension was studied. Dynamics of ink spreading were also tested using dynamic contact angle measurements. It is shown that ink containing primary alcohol wets the surface more readily than surfactant containing systems. Addition of alcohols and surfactant had also positive effect leveling and bulk conductivity of final inks. More uniform layers were produced when using inks with lower surface tension. Increased bulk conductivity by addition of ethylene glycol is believed to be a result of conformational change and increased interaction between polymer chains. Stronger interactions between polymer chains were also confirmed by rheological measurements.