

# Characterization of Conductive Polymer Inks based on PEDOT:PSS

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## Abstract

Since the discovery of conductive polymers in the mid-1970, they have been very popular and widely researched among scientists worldwide. Nowadays, polymeric materials exhibiting electrical conductivity are very promising for applications in low-cost and disposable electronics. In addition, some polymeric materials can be solution processable, which makes the implementation of existing printing technologies to electronics manufacture possible. Among conductive polymers, the properties and performance of polyaniline (PANI) and poly(3,4-ethylenedioxy-thiophene)-poly(styrene sulfonate) (PEDOT: PSS) inks are studied and optimized for deposition by different printing methods. The present work focuses on properties of PEDOT: PSS based polymer inks. Electrical conductivity of PEDOT: PSS films can be increased by addition of alcohols; ethylene glycol was used in this work to enhance conductivity. Other modifications made to aqueous solution of PEDOT:PSS were addition of ethanol and non-ionic surfactant. Applicability of the PEDOT:PSS ink to printing process was addressed with consideration of surface tension, surface roughness of the deposited films and their electrical conductivity depending on the ink formulation. The reduction of surface tension of water based solution of conductive polymer was studied by two different methods. The resulting inks were characterized in terms of static (pendant drop) and dynamic surface tension (maximum differential bubble pressure) and dynamic contact angle (sessile drop). Surface topography of PEDOT:PSS films was studied using white light interferometry and atomic force microscopy. Surface uniformity has significantly improved for inks with addition of ethylene glycol. It was observed that the addition of ethylene glycol increased the conductivity of the films almost 20 times as measured by four-point probe technique.

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