Investigation of Conductive Polymer-DNA Biocomposites for Bioelectronics

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Abstract

Poly(3,4-ethylenedioxythiophene):poly(styrene sulfonate) (PEDOT:PSS) is commonly used as a conductive polymer for organic electronics and bioelectronics due to its conductivity, processability, and commercial availability.[1,2] However, PEDOT:PSS presents some limitations associated with the low-biocompatibility of PSS unit.[3] A recent strategy is to incorporate PEDOT with biomolecule dopants, e.g., deoxyribonucleic acid (DNA), hyaluronic acid, dextran sulfonate, heparin, pectin, guar gum to improve its biocompatibility.[2] Among those, PEDOT-DNA has a great advantage over PEDOT:PSS because of its high ionic conductivity.[4] However, the thin film morphology of PEDOT-DNA restricts its performance in some applications such as Bio-Organic Field Effect Transistors (BioFETs).[5]

Herein, we report the oxidative chemical polymerization of PEDOT and polypyrrole using DNA as the stabilizer and dopant counterion. We successfully deposited the thin films of biocomposites on glass from their dispersed solutions by drop-casting and spin-coating. We investigated the electrical, optical, and morphological properties of the films. The electrical conductivity of the films was determined higher in comparison to commercially available PEDOT:PSS. The morphological studies were carried out with the help of an Atomic Force Microscopy (AFM) and Scanning Electron Microscopy (SEM).

Keywords: *Conductive polymers, PEDOT, polypyyrole, DNA, biocomposites.*

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Biography

Dr. Tekoglu received her MSc degree in Energy at Ege University (Turkey) in 2009 and then was appointed as the Marie Skłodowska-Curie scholar at Johannes Kepler University (JKU Linz, Austria) for 1.5 years. Between 2012-2016, she worked as scientific staff at Karlsruhe Institute of Technology (Germany). After receiving her Ph.D. in Materials Engineering at the Technical University of Darmstadt in 2018, she has become a research associate at JKU Linz to pursue her research activities.