Abstract Submitted
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Direct Imaging of the Electrochemical Polymerization of Polythiophenes by In-Situ Transmission Electron Microscopy[1] DAVID MARTIN, Univ of Delaware, JINGLIN LIU, BIN WEI, CHIN-CHEN KUO, ANIRHUDDA DUTTA, VIVEK SUBRAMANIAN, The University of Delaware, MATERIALS SCIENCE AND ENGINEERING TEAM — Functionalized poly(thiophenes) such as poly(3,4-ethylene dioxythiophene) (PEDOT) are of considerable interest for a wide variety of applications including biomedical devices for interfacing electronic components with living tissue. The electrochemical deposition process involves oxidative polymerization of an aqueous EDOT monomer solution, resulting in precipitation of PEDOT onto a solid electrode as the reaction continues. The detailed mechanisms of this process have remained obscure, since it is experimentally difficult to determine local, high resolution information about the transition from the liquid precursor monomer solution to the solid polymer product. Here, we discuss recent results from our laboratory using low dose, in-situ transmission electron microscopy with an electrochemical liquid flow cell. This method has allowed us to quantify the nucleation and growth of droplets of PEDOT oligomers and polymers with current during the electrochemical polymerization and solidification process. Our ongoing efforts are focused on understanding the influence of systematic variations in the composition of the reaction medium, particularly the role of additives such as macromolecular counterions, gels, and solid particles.

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David Martin
Univ of Delaware

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