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Microstructure and conductivity of in-situ polymerized poly(3,4-ethylenedioxythiophene) (PEDOT) crystals[1] JINGLIN LIU, LIANGQI OUYANG, Materials Science and Engineering, The University of Delaware, JING-HANG WU, Materials Science and Engineering, The University of Delaware; Macromolecular Science and Engineering Center, The University of Michigan, CHIN-CHEN KUO, BIN WEI, DAVID MARTIN, Materials Science and Engineering, The University of Delaware — Conjugated polymers are widely used in organic solar cells, biomedical devices, and chemical sensors. Both chemical and electrochemical methods have been developed for preparing conducting polymers, but the extent of crystalline order is usually modest. Here we synthesized highly-ordered brominated (3,4-ethylenedioxythiophene) (EDOT-Br) monomer crystals via electrochemical methods. The kinetics of the synthesis was studied with a Quartz Crystal Microbalance (QCM) and Cyclic Voltammetry (CV). The chemical structure of the EDOT-Br monomer has been confirmed by Nuclear Magnetic Resonance (NMR), Ultraviolet-Visible Spectroscopy (UV-Vis), Fourier Transform Infrared Spectroscopy (FTIR), and Mass Spectrometry (MS). The EDOT-Br monomer crystals can be in-situ polymerized into highly ordered PEDOT conjugated polymer crystals by annealing at temperatures below the EDOT-Br melting point. The crystalline structure was studied by optical microscopy, electron microscopy and X-Ray analysis. The conductivity and electrochemical properties of both the EDOT-Br monomer and corresponding PEDOT polymer crystals were examined with electrochemical impedance spectroscopy (EIS) and CV.

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