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Conductive Paper by LBL Assembly of PSS and ITO onto Wood Fibers and its Electrical Properties through Impedance Spectroscopy and I-AFM CHUNQING PENG, YONATHAN THIO, ROSARIO GERHARDT, Georgia Institute of Technology — Conductive paper has been fabricated by layer-by-layer (LBL) assembly of polyelectrolytes and indium tin oxide (ITO) nanoparticles onto wood fibers, followed by traditional paper making method. The wood fibers were first coated with polyethyleneimine (PEI) and then LBL assembled with poly(sodium 4-styrenesulfonate) (PSS) and ITO for several bilayers. The AC electrical properties, measured for frequencies ranging from 0.01 Hz to 1 MHz, will be reported for the in-plane (IP) and through-the-thickness (TT) directions. With 10 bilayers of PSS/ITO assembly on wood fibers, the conductivity of as-prepared paper was improved by more than six orders of magnitude and reach to 5.2×10^{-6} S cm^{-1} in IP direction and 1.9×10^{-8} S cm^{-1} in TT direction. The percolation phenomenon of ITO nanoparticles through the handsheet in both directions was observed through current atomic force microscopy (I-AFM). By applying a bias voltage, either on one end of the paper stripes or on one side of the paper handsheet, the current can be detected on the other end of the paper stripes or on the other side of the paper handsheet. PEI can be used to modify the ITO suspension and significantly improve the LBL procedure. The mechanism of PEI modifying ITO colloidal suspension will be discussed.

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