SAMPLE 2

Alternatives to Chlorinated Solvents for Greener Organic Field-Effect Transistor Processing

Organic field-effect transistors (OFETs) may potentially be incorporated into many modern electronics, finding application in signal amplifiers and RF-ID tags. Unlike their inorganic counterparts, OFETs can be fabricated on flexible substrates and processed from solution. The organic semiconductor (OSC) in this case is a conjugated polymer, which possesses conjugated π-bonds that charge carriers—electrons and holes—can travel through. To fabricate an OFET, the OSC layer is deposited as a film onto the substrate surface, often by spin-coating or blade-coating a solution of the dissolved polymer. Many conjugated polymers, such as the undisclosed polymer that we investigated here, are processed in chlorinated and aromatic solvents. Chlorinated and aromatic solvents such as chlorobenzene raise ecological concerns when considering processing and disposal; however, alternatives are currently being sought. A proposed solvent, 2-methyltetrahydrofuran (2-MeTHF), is one alternative and is useful in that it fits a criterion for the Seventh Principle of the Twelve Principles of Green Chemistry, which states that a chemical is considered green if it is made from raw, renewable materials. We investigate the efficacy of 2-MeTHF as a suitable solvent for the undisclosed polymer in addition to semiconductor-polystyrene blends, which further reduce fabrication costs of OSC film processing through current-voltage measurements and morphological characterizations like atomic force microscopy (AFM.) The OFET performance for the undisclosed polymer in 2-MeTHF matches the performance in chlorobenzene. Greener processing solvents such as 2-MeTHF would potentially replace ecologically harmful chlorinated solvents, which, when translated to the industrial level, can make a significant impact in chemical waste reduction.