MAR15-2014-020437

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

Combining and Correlating DC, Modulated, and Transient Measurement Techniques to Disentangle and Quantify Key Physical Properties for Organic Semiconductor Devices

DAVID GUNDLACH, NIST

Organic thin film electronics offer the potential to significantly impact how humans interface with their surroundings and society in general. Substantial contributions over the past two decades in this highly multidisciplinary area of research have led to significant improvements in discrete device performance and several impressive advanced technology demonstrations. However, fundamental understanding and quantification of the physical properties and processes that govern device operation remains limited compared to conventional semiconductors, such as silicon. In this presentation I will discuss our recent development and application of combined and correlated optical-electrical measurement methods to obtain a more nuanced understanding and quantification of the critical properties and fundamental processes relevant to device operation. In particular, I will discuss the use of steady state and pulsed light techniques combined with modulated and DC electrical measurements tailored to the specific operating regimes and device structures of organic diodes (solar cells and light emitters) and transistors to provide greater understanding of charge injection, transport, lifetime, density, and recombination kinetics.