

Contribution ID: 225

Type: Oral Presentation

## Non-linear Fowler-Nordheim plots in thin film polymer-fullerene composite devices: Transition from electron-only to hole-only conduction

Thursday, 14 July 2011 11:15 (15 minutes)

We studied charge injection and transport mechanisms in blends of poly(3-hexylthiophene) (P3HT) and [6,6]-phenyl C61-butyric acid methylester (PCBM), by analysing dark, temperature dependent current-voltage characteristics of the P3HT:PCBM blend thin films sandwiched between aluminium electrodes in a MIM configuration. We present a general method of interpreting Fowler - Nordheim plots of metal/semiconductor/metal devices with pronounced non-linear characteristics by dividing them into several regions based on physical origins. We show that by applying appropriate electric fields it is possible to switch from electron-only conduction to hole-only conduction in a single Al/P3HT:PCBM/Al device. We affirm that electrons can be selectively transported through the lowest unoccupied molecular orbital of PCBM at low applied voltages and low temperatures; and alternatively holes can be transported through the highest occupied molecular orbital of P3HT at higher applied voltages and high temperature, within a single device.

## Level (Hons, MSc, <br> &nbsp; PhD, other)?

PhD

## Consider for a student <br> &nbsp; award (Yes / No)?

No

## Would you like to <br> submit a short paper <br> for the Conference <br> Proceedings (Yes / No)?

Yes

Primary author: Dr CHIGUVARE, Zivayi (University of the Witwatersrand)

Presenter: Dr CHIGUVARE, Zivayi (University of the Witwatersrand)

Session Classification: CMPMS2

Track Classification: Track A - Condensed Matter Physics and Material Science