EMCMRE-1
Marrakech-Morocco
November 21-25 2011

First Euro-Mediterranean Conference on Materials and Renewable Energies (EMCMRE-1) 21-25 November 2011

Orientation of carbon nanotubes (CNT) in semiconducting polymer hosts using electric fields for optoelectronic applications.

Marzouk Jaouad*, Johann Bouclé*, Arnaud Pothier, and Bernard Ratier

XLIM UMR 6172, Université de Limoges/CNRS, 123 Av. A. Thomas, 87060 Limoges Cedex, France
*corresponding authors: Jaouad.marzouk@xlim.fr ; johann.boucle@unilim.fr

Carbon nanotubes (CNTs) are good candidates for electronic and optoelectronic devices because of their unique physical properties [1, 2]. CNT coupling or combination with semi-conducting polymer hosts is a promising strategy to demonstrate cheap functional nanocomposites in printed electronics or optoelectronics fields [3, 4]. Meanwhile the difficulty to finely control their dispersion is a strong limitation to their development. In this work, we report on the controlled structuration of blends of CNT with the poly-(3-hexylthiophene) (P3HT) conjugated polymer, to demonstrate organic nanocomposites presenting improved and tunable electrical properties. First, we present a study on the influence of the main parameters controlling the CNT dispersion and orientation on planar devices or in the polymer host matrix using a simple drop-casting procedure under applied electric field. Used planar inter-digited electrode geometries allows both morphological, spectroscopic, and electrical characterizations, as a function of the experimental conditions used (concentration, nature of the solvent, applied electric field characteristics,etc.). Finally, the resulting field-effect transistor geometry enables the charge transport properties characterization for the obtained nanocomposites as a function of CNT loading and dispersion.

[1] R.Saito and al. Applied Physics Letters, 60: 2204, (1992).
[2] W. Hoenlein and al. IEEE Trans.Comp.Pack.Technol.27 (2004)629.
[3] H. Ageo and al. Adv.Mater.11 (2005) 1281.
[4] J.Wang,J.Dai,T.Yarlagadda, Langmuir 21 (2005) 9.