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Modeling and Characterization of Organic LED

Authors : Bouanati Sidi Mohammed, N. E. Chabane Sari, Mostefa Kara Selma

Abstract : It is well-known that Organic light emitting diodes (OLEDs) are attracting great interest in the display technology industry due to their many advantages, such as low price of manufacturing, large-area of electroluminescent display, various colors of emission included white light. Recently, there has been much progress in understanding the device physics of OLEDs and their basic operating principles. In OLEDs, Light emitting is the result of the recombination of electron and hole in light emitting layer, which are injected from cathode and anode. For improve luminescence efficiency, it is needed that hole and electron pairs exist affluently and equally and recombine swiftly in the emitting layer. The aim of this paper is to modeling polymer LED and OLED made with small molecules for studying the electrical and optical characteristics. The first simulation structures used in this paper is a mono layer device; typically consisting of the poly (2-methoxy-5(2'-ethyl) hexoxy-phenylenevinylene) (MEH-PPV) polymer sandwiched between an anode usually an indium tin oxide (ITO) substrate, and a cathode, such as Al. In the second structure we replace MEH-PPV by tris (8-hydroxyquinolinato) aluminum (Alq3). We choose MEH-PPV because of it's solubility in common organic solvents, in conjunction with a low operating voltage for light emission and relatively high conversion efficiency and Alq3 because it is one of the most important host materials used in OLEDs. In this simulation, the Poole-Frenkel- like mobility model and the Langevin bimolecular recombination model have been used as the transport and recombination mechanism. These models are enabled in ATLAS -SILVACO software. The influence of doping and thickness on I(V) characteristics and luminescence, are reported.

Keywords : organic light emitting diode, polymer lignt emitting diode, organic materials, hexoxy-phenylenevinylene
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