

(54) Title of the invention : AN ANALYSIS OF ORGANIC SOLAR CELL AT DIFFERENT ACTIVE LAYER THICKNESS AND CHARGE CARRIERS MOBILITY

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(57) Abstract :

The present invention discloses a comprehensive analysis of organic solar cells employing P3HT: PCBM materials. The method provides a comprehensive analysis of bulk heterojunction organic solar cells using P3HT: PCBM materials, focusing on the influence of active layer thickness and charge carrier mobility on device performance. Optical and electrical simulations were conducted using GPVDM software to evaluate solar cell characteristics at varying active layer thicknesses (100 nm, 180 nm, 200 nm, and 220 nm) and hole mobilities ( $1 \times 10^{-4}$  cm $^2$ /Vs,  $1 \times 10^{-5}$  cm $^2$ /Vs,  $1 \times 10^{-6}$  cm $^2$ /Vs, and  $1 \times 10^{-7}$  cm $^2$ /Vs). The study demonstrates that the current-voltage (J-V) characteristics are significantly impacted by hole mobility, with optimal performance observed at  $1 \times 10^{-6}$  cm $^2$ /Vs mobility and maximum absorption at 200 nm. Furthermore, the efficiency of organic solar cells is shown to increase as mobility decreases (from  $10^{-4}$  to  $10^{-6}$ ), while efficiency decreases above  $10^{-7}$  mobility.

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