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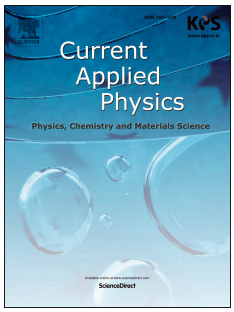

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Enhanced Efficiency and Stability of Polymer Solar Cells using Solution-processed Nickel Oxide as Hole Transport Material

Shanmugam Parthiban[a+], Seungmin Kim[a+], Vellaiappillai Tamilavan[a], Jihoon Lee[a], Insoo Shin[a], D.Yuvaraj[b], Yun Kyung Jung[c], Myung Ho Hyun[d], Jung Hyun Jeong[a], and Sung Heum Park[a,*]

[a] Department of Physics, Pukyong National University, Busan 608-737, Republic of Korea
[b] School of Electronic, Electrical and System Engineering, University of Birmingham, Birmingham, B15 2TT, United Kingdom
[c] School of Biomedical Engineering, Inje University, Inje-ro 197, Gimhae, Gyeongnam 50834, Republic of Korea
[d] Department of Chemistry, Chemistry Institute for Functional Materials, Pusan National University, Busan 690-735, Republic of Korea.

[+] These authors made equal contribution to this work.

Abstract

Solution-processed nickel oxide (s-NiO_x) was synthesized for use as hole-transport layers (HTLs) in the fabrication of polymer solar cell (PSC) devices. The s-NiO_x thin-films were deposited using spin-coating and post-annealed at 300 °C, 400 °C, or 500 °C. With increased annealing temperature, the nickel acetate precursor decomposes more fully and forms s-NiO_x films that show larger crystalline grain sizes with lower root mean square surface roughness. Bulk heterojunction solar cells fabricated with the new random polymer RP(BDT-PDBT) and [6,6]-phenyl-C_{70}-butyric acid methyl ester ($PC_{70}BM$) using s-NiO_x as HTLs exhibit a 4.46% enhancement in power conversion efficiency and better stability compared to conventional PSCs using poly (3,4-ethylenedioxythiophene):poly(styrene sulfonate) as HTLs. We believe that the solution-processable and highly stable s-NiO_x could be a potential alternative for functional interface materials in optoelectronic devices.