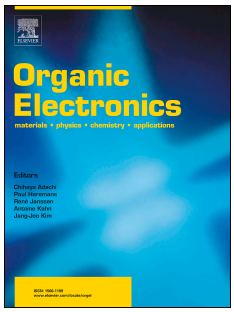
Accepted Manuscript



Erbium (III) tris(8-hydroxyquinoline) doped zinc oxide interfacial layer for improved performance of polymer solar cells

B. Hari Babu, Chengkun Lv, Chengzhuo Yu, Pengqing Bi, Zhenchuan Wen, Xiaoyu Yang, Fenghong Li, Xiao-Tao Hao

PII: S1566-1199(18)30370-7

DOI: 10.1016/j.orgel.2018.07.013

Reference: ORGELE 4793

To appear in: *Organic Electronics*

Received Date: 7 June 2018

Revised Date: 15 July 2018

Accepted Date: 16 July 2018

Please cite this article as: B.H. Babu, C. Lv, C. Yu, P. Bi, Z. Wen, X. Yang, F. Li, X.-T. Hao, Erbium (III) tris(8-hydroxyquinoline) doped zinc oxide interfacial layer for improved performance of polymer solar cells, *Organic Electronics* (2018), doi: 10.1016/j.orgel.2018.07.013.

Erbium (III) tris(8-hydroxyquinoline) doped zinc oxide interfacial layer for improved performance of polymer solar cells

B. Hari Babu[1], Chengkun Lv[1], Chengzhuo Yu[2], Pengqing Bi[1], Zhenchuan Wen[1], Xiaoyu Yang[1], Fenghong Li[2] and Xiao-Tao Hao[1,3*]

[1]School of Physics, State Key Laboratory of Crystal Materials, Shandong University, Jinan, Shandong 250100, China.
[2]State Key Laboratory of Supramolecular Structure and Materials, Institute of Theoretical Chemistry, Jilin University, Changchun 130012, P. R. China.
[3]ARC Centre of Excellence in Exciton Science, School of Chemistry, University of Melbourne, Parkville, Victoria 3010, Australia.

Abstract: Erbium (III) tris(8-hydroxyquinoline) ErQ complex is emerging as a class of novel luminescent material for interfacial engineering to improve the performance of organic solar cells (OSCs). In the present work, ErQ doped ZnO solution has successfully been prepared by the sol-gel route at room temperature as an electron transport layer for high efficient OSCs. The modified ErQ:ZnO films can yield not only higher electron mobility, good surface quality by the passivation of ZnO defects, but also slightly higher work-function and thereby shortening in the leakage current, which subsequently enhanced power conversion efficiency (PCE). As a result, the remarkable PCE increasing from 3.62 % to 4.26 % for poly(3-hexylthiophene):phenyl-C61-butyric acid methyl ester (P3HT:$PC_{61}BM$) and from 6.84 % to 7.95 % for polymer thieno [3,4-b] thiophene/benzodithiophene: [6,6] phenyl-C_{71}-butyric acid methyl ester (PTB7:$PCB_{71}M$) devices could be achieved upon an incorporating ErQ:ZnO interfacial layer.

Keywords: Organic solar cells; P3HT:$PC_{61}BM$; PTB7:$PC_{71}BM$; PL; XPS; AFM

****

*Corresponding author: haoxt@sdu.edu.cn Tel.: +86-531-58783287