Solution Processed 8-Hydroquinolatolithium as Effective Cathode Interlayer for High Performance Polymer Solar Cells

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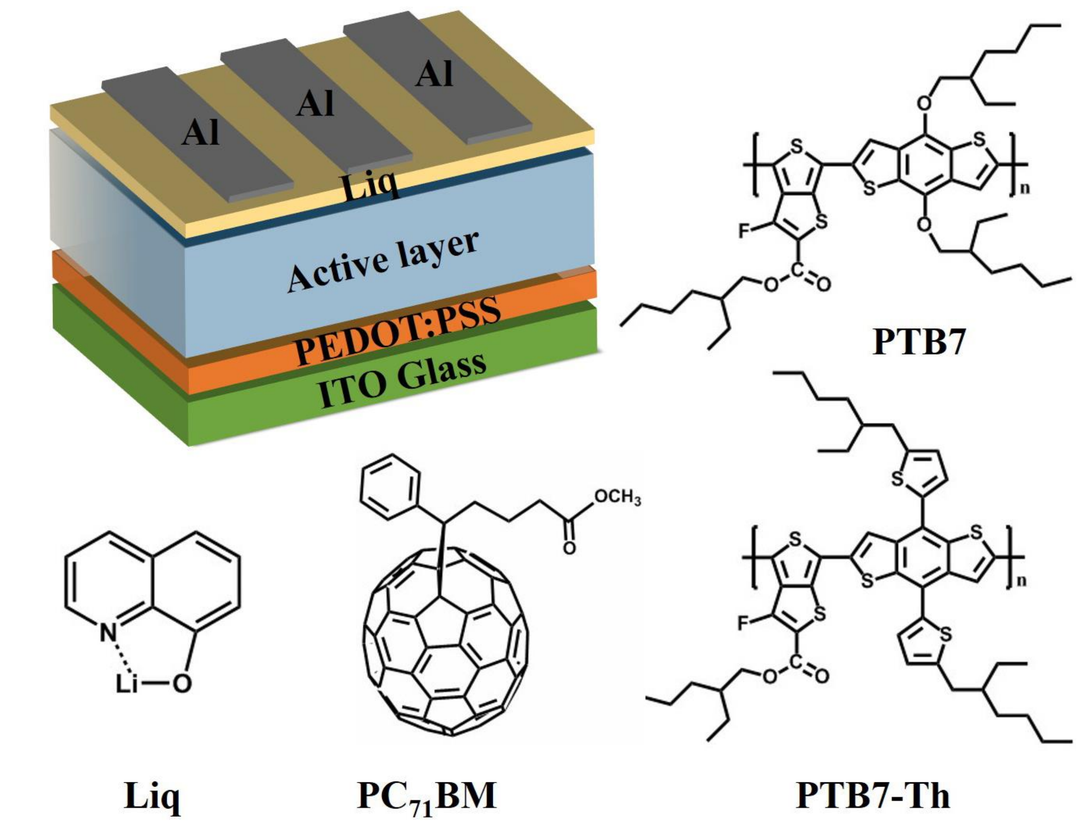
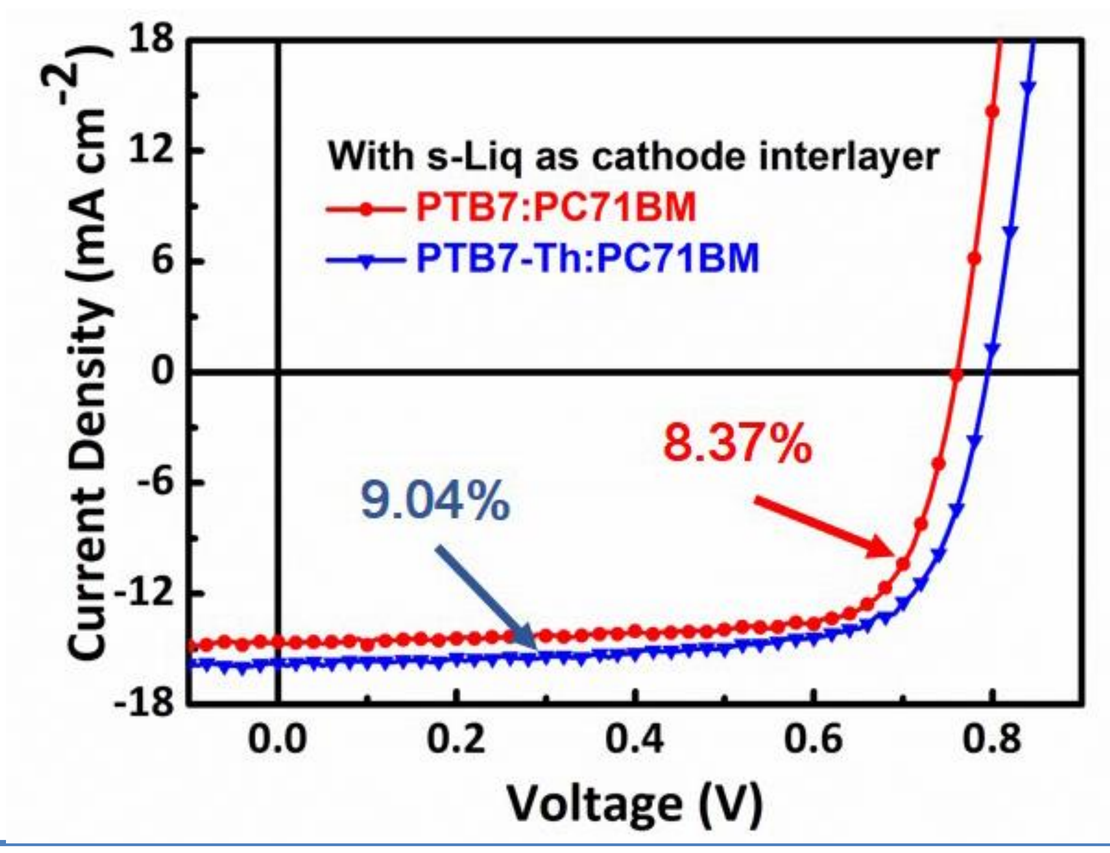
Abstract: Solution processed 8-hydroxyquinolinatolithium (s-Liq) was successfully applied as an efficient cathode interlayer in bulk heterojunction polymer solar cells (PSCs), giving rise to enhancement in device performance. With PTB7 (or PTB7-Th) as donor and $PC_{71}BM$ as acceptor, the s-Liq based PSC devices exhibited a power conversion efficiency (PCE) of 8.37% (or 9.04%), much higher than those of devices with the evaporated Liq (7.62%) or commonly used PFN (8.14%) as cathode interlayer. Moreover, the s-Liq based devices showed good stability, maintaining 75% (in N_2) and 45% (in air) of the initial PCE after 7 days, respectively. These results suggest the great potential of s-Liq as cathode interlayer material for high performance solar cells application.

Materials and device structure

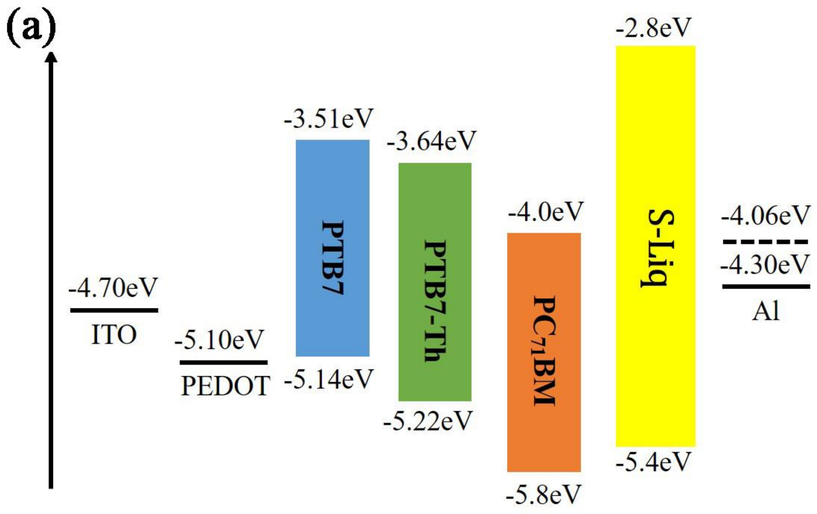


Performances of s-Liq based devices

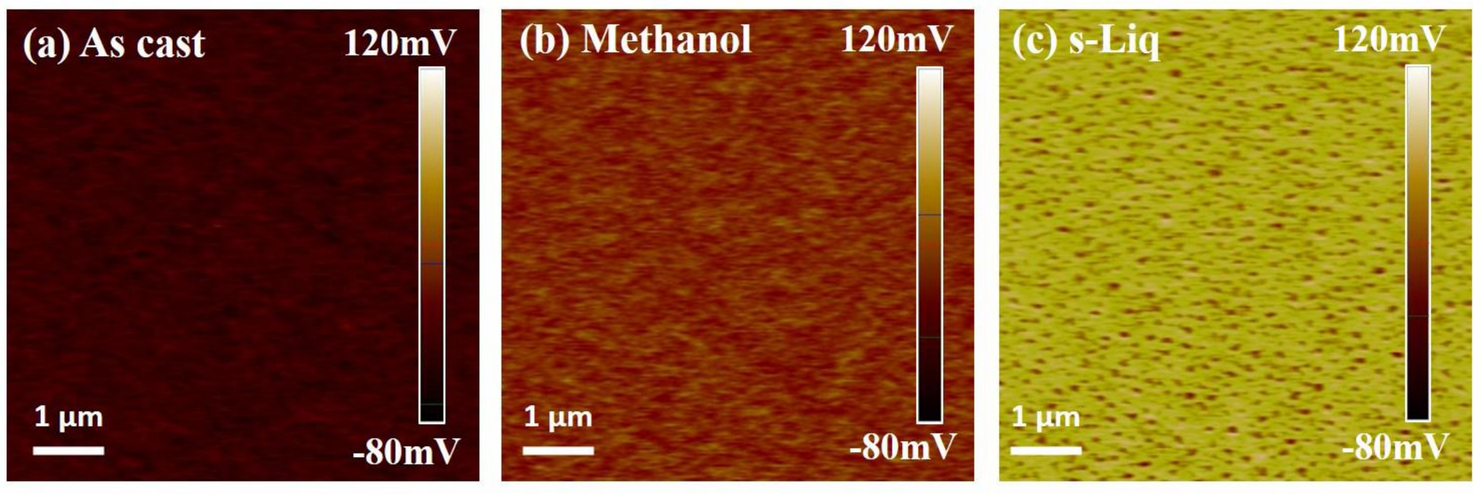


Effect of s-Liq Interlayer on the Efficiency Enhancement of devices

- The insertion of s-Liq lowers the work function of Al electrode



- Introducing s-Liq interlayer can provide strong electric dipole between the Al electrode and active layer



Conclusions: we successfully demonstrated the application of solution processed Liq as an efficient cathode interlayer for highly efficient and stable PSCs. Our work develops a simple solution method used for the cathode interlayer deposition and these successful results prove the feasibility of s-Liq as an efficient cathode interlayer applicable in PSCs.

References:

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[2] Liu, W.; Liang, T.; Chen, Q.; Yu, Z.; Zhang, Y.; Liu, Y.; Fu, W.; Tang, F.; Chen, L.; Chen, H.. ACS Appl. Mater. Interfaces 2016. 10.1021/acsami.6b00327