

Polymer solar cells with efficiency >10% enabled via a facile solution-processed Al-doped ZnO electron transporting layer (Presentation Recording)

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ABSTRACT

The present work details a facile and low-temperature (125C) solution-processed Al-doped ZnO (AZO) buffer layer functioning very effectively as electron accepting/hole blocking layer for a wide range of polymer:fullerene bulk heterojunction systems, and yielding power conversion efficiency in excess of 10% (8%) on glass (plastic) substrates. We show that ammonia addition to the aqueous AZO nanoparticle solution is a critically important step toward producing compact and smooth thin films which partially retain the aluminum doping and crystalline order of the starting AZO nanocrystals. The ammonia treatment appears to reduce the native defects via nitrogen incorporation, making the AZO film a very good electron transporter and energetically matched with the fullerene acceptor. Importantly, highly efficient solar cells are achieved without the need for additional surface chemical passivation or modification, which has become an increasingly common route to improving the performance of evaporated or solution-processed ZnO ETLs in solar cells.

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