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International Conference on

Materials Science and Engineering

July 23-25, 2018 | Moscow, Russia

## Binary blended small-molecule cathode buffer layer materials for highly efficient organic photovoltaic cells

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In this topic the concept of design rational, and the photovotaic properties from a series binary blended small-molecule cathode buffer layer (CBL) maetrials for fabricating high-efficiency organic photovoltaic cells has presented. As an example, I herein show that the old and famous dye, N719, can be utilized as high-efficiency, alcohol solution-processible cathode buffer layer (CBL) material. N719 and the binary N719:Pr$C_{60}$MAI CBL, respectively, affords 10.50% and 11.46% efficiency, single-junction ternary polymer solar cells. The work function of the Al cathode can be modulated between -3.3 eV and -3.9 eV simply by controlling the binary components weight ratios, which is due to the weight-ratio dependent re-arrangment between the four kinds of cations and anions. With this binary blend as the CBL, a PCE of 11.3% was achieved from a new nonfullerene small-moelcule acceptor. The synthesis to this $C_{60}$ derivative is relatively complicated and this inevitably increases the cost, while the future application for commercialization requires low-cost but high performance CBL materials. We therefore turn a cheap phosphorous derivative, tetraphenylphosphonium bromide (QPhPBr), with which and its binary blend with N719 as the CBL, high-efficiency fullerene and nonfullerene polymer solar cells have been realized

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