# High Efficient Perovskite Solar Cells Utilizing Mesogenic Phthalocyanine Hole Transport Material Layers

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## Abstract

The most efficient perovskite solar cells (PSCs) have usually employed hole transporting materials (HTMs), which play a key role in hole transportation and retardation of charge recombination. However, improvement in the photovoltaic performance of PSCs mainly relies on optimizing various device fabricating methods, elaborate engineering of perovskite morphology, and composition [1,2]. Thereby, seeking appropriate HTMs with advantages of low cost and high efficiency is urgent for the future application. Recently, mesogenic phthalocyanine derivative (C*n*PcH$_2$) have been demonstrated the high hole mobility exceeding 1.4 cm$^2$ V$^{-1}$ s$^{-1}$ in the crystalline phase [3,4]. C*n*PcH$_2$ possesses a deep highest occupied molecular orbital of around -5.3 eV and the energy bandgap of 1.6 eV [5-7]. The aforementioned energy level and high charge carrier mobility indicates that the perovskite/C*n*PcH$_2$ heterojunctions within the photoactive region can dissociate charges and the C*n*PcH$_2$ can play a role as a HTM layer. In addition, the excellent characteristics, such as high solubility into common organic solvents, strong self-organizing nature has made the phthalocyanine derivatives much more suitable for HTM layer in PSCs [8]. Herein, I report: (*i*) Recently notable achievements in PSC and (*ii*) High efficient PSCs utilizing C*n*PcH$_2$ HTMs.

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