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Monte Carlo Simulations for Charge Transport in Bulk-Heterojunction Solar Cells: Effect of Morphology on Charge Carrier Mobility YOUNG MIN NAM, WON HO JO, Department of Materials Science and Engineering, Seoul National University, Seoul, Republic of Korea — Although it is well understood that the nano-scaled morphology of active layer is critical for determining the efficiency of bulk-heterojunction solar cells, the effect of the variation in morphology upon the local mobility of charge carriers and the performance of solar cell has largely been unknown. Since the computer simulation is a powerful method to provide important information for the relationship between mobility and morphology, we use a Monte Carlo to reveal the dependence of mobility upon the morphology. As the domain size and the blend composition of morphology across the active layer are systematically varied, the mobility of charge carriers and the solar cell performance are calculated. The result of simulation reveals that the charge carrier mobility and the performance of solar cell improved largely due to the efficient extraction of charge carriers at the electrodes, when the domain size is optimized and the blend composition becomes donor-rich at the anode and acceptor-rich at the cathode.

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