Control of Active Layer Surfaces by Nanoimprinting for Efficient Polymer Solar Cells

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As growing the importance of sustainable energy conversion, conjugated polymer based solar cells have received considerable attention because of the low-cost and flexible characteristics. Polymer based organic photovoltaic cells have significant advantage of cost-effectiveness which is driven from solution processability. Among the various systems, poly (3-hexylthiophene) (P3HT) and [6,6]-phenyl-C61-butyric acid methyl ester (PCBM) system showed the highest power conversion efficiency about 5%. However much effort is required to improve the efficiency. Uncontrollable morphology is one of the problems for enhancing power conversion efficiency. In the bulk heterojunction structure, undesired disordered nanostructure is created. In most cases, the length scale is too large, so some of the generated excitons are not able to diffuse to the interface, and consequently the excitons decay before dissociation. In this research, we controlled the surface morphology of bulk heterojunction system with nanometer length scale, which gives a result of decreasing dead ends and increasing electron transport, and consequently increasing the power conversion efficiency.