Solar Cells with Power Conversion Efficiency of over 6.5%

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Polymer solar cells (PSCs) have been considered as promising candidates for generating power for the flexible and portable devices, but they are not durable enough for such applications. Thus, we have developed highly-efficient, mechanically-stable all-PSCs that consist of polymer donor and polymer acceptor. All-PSCs based on PBDTTTPD donor and polymer acceptor showed a power conversion efficiency (PCE) of 6.5%, which outperforms that of the PBDTTTPD:fullerene-based PSCs. To the best of our knowledge, this is the highest PCE value demonstrated to date for all-PSCs. More importantly, all-PSCs have remarkably better mechanical properties than fullerene-based PSCs. For example, the elongation at break of all-PSCs was 70 times higher, and their tensile modulus was 4 times lower than those of fullerene-based PSCs. These physical properties, along with the results of the bending tests, demonstrate that all-PSCs have great potential for use in flexible and wearable devices.