

Lateral Junctions Reaching 1 cm for Organic Solar Cells

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Recently, we reported a lateral alternating multilayered junction using a high mobility organic semiconductor¹. In this study, we fabricated lateral junction cells having distance reaching cm order (Fig. 1). A donor [C8-BTBT ($\mu_h = 43 \text{ cm}^2\text{V}^{-1}\text{s}^{-1}$)] – acceptor [PTCDI-C8 ($\mu_e = 1.7 \text{ cm}^2\text{V}^{-1}\text{s}^{-1}$)] combination was used. Buffer layers of BCP and MoO₃ were used for the selective carrier collection of electrons and holes, respectively (Fig. 1(a)). Even lateral cells with L=10 mm showed clear photovoltaic behavior (Fig. 2, red curve). Short-circuit photocurrent (I_{sc}) decreases with increase of lateral electrode distance (L) above 2 mm due to electron transport limit (Figs. 1(b) and 1(c)). On the other hand, hole transport limit exceeds 10 mm (Fig. 1(c)). Thus, operation of lateral junction cells of the order of cm was demonstrated.

1) M. Kikuchi, et al, *ACS Appl. Energy Mater.*, 2, 2087-2093 (2019).

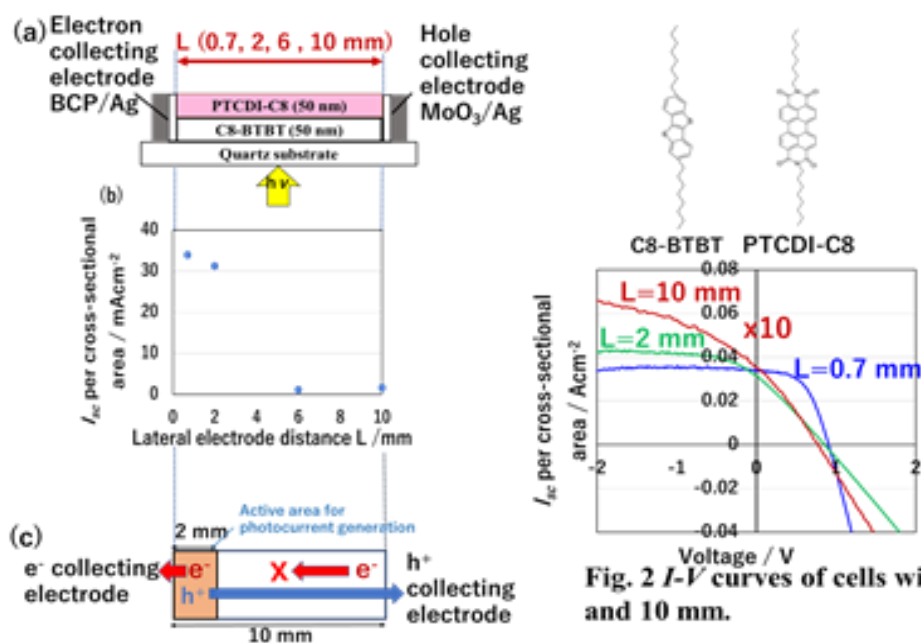


Fig. 1 (a) Device structure.
(b) Dependence of I_{sc} on lateral electrode distance (L).
(c) Transport of electrons and holes in lateral cells.

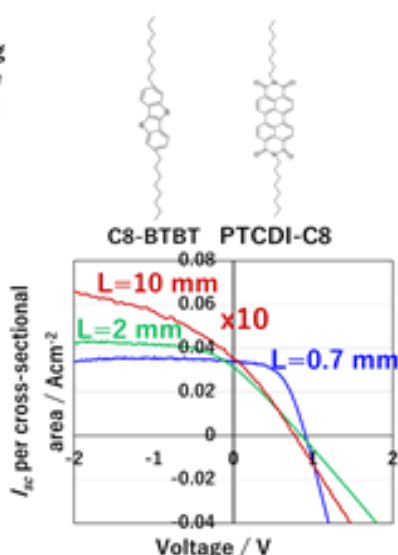


Fig. 2 I - V curves of cells with L = 0.7, 2 and 10 mm.