Influence of the presence of Ca in the cathode buffer layer on the performance and stability of organic photovoltaic cells using a branched sexithienylenevinylene oligomer as electron donor

Titre	Influence of the presence of Ca in the cathode buffer layer on the performance and stability of organic photovoltaic cells using a branched sexithienylenevinylene oligomer as electron donor
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Résumé en anglais	A new branched sexithienylene vinylene oligomer, (E)-bis-1,2-(5,5″-dimethyl-(2,2′:3′,2″-terthiophene)vinylene (BSTV), was synthesized, characterized, and used as the electron donor in a planar heterojunction organic photovoltaic cell (OPVC). The OPVC utilized fullerene (C_{60}) as the electron acceptor, ITO-coated glass as the anode, and aluminum as the cathode. Hybrid electrode buffer layers of MoO_3/CuI on the anode side and of Alq_3/Ca on the cathode side were used. This shows the effectiveness of the bilayer Alq_3/Ca as a cathode buffer layer. The thickness of the Ca layer and its effect on the performance and lifetime of the OPVCs were studied. It was found that an Alq_3/Ca structure with 6 nm of Alq_3 and 3 nm of Ca has an efficiency (η) of 2.28%, while a device without Ca has an efficiency of only 1.47%. Combining an optimized thickness of the new donor BSTV (22 nm) together with the bilayer cathode buffer layer, a device having an open-circuit voltage, V_{oc} of 0.84 V, a short-circuit current, J_{sc} of 3.60 mA cm^{-2}, and a fill factor, FF of 50% was achieved. However, the efficiency of the OPV with Ca decreases rapidly during the first hours of air exposure, resulting in device performance that is similar to a device fabricated without Ca. After this initial degradation, device performance for both types of OPV evolves similarly with continued air exposure.
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