Nanocarbon-based Organic and Perovskite Solar Cells

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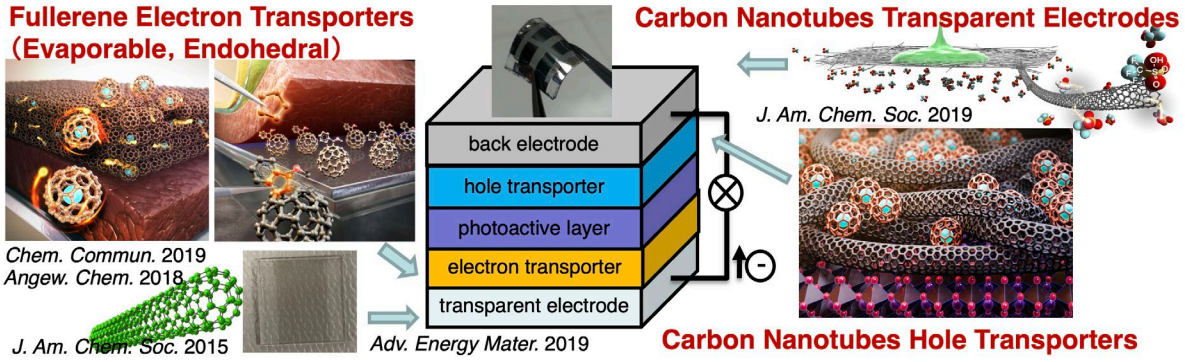
We introduce nanocarbon materials such as appropriately designed fullerene derivatives, endohedral fullerenes, and carbon nanotubes improving performance and stability in organic and perovskite solar cells. We applied wet-processed and dry-processed single-walled carbon nanotubes (SWCNT) films to transparent and back electrodes in organic solar cells for large area solar cells. For example, gas-phase growth SWCNT was dispersed in solvent and spray-coated on a substrate for fabricating SWCNT transparent electrode in organic solar cells. Carbon nanotubes can be doped with nitric acid, trifluoromethanesulfonic acid, and molybdenum oxide as well as modified with a variety of organic semiconductors such as spiro-MeOTAD, conjugating polymers such as P3HT and PTAA, and lithium-ion containing fullerene to improve conductively and charge selectivity. Flexible perovskite solar cells with carbon nanotubes films electrodes at both anode and cathode can also be realized by using neither transparent conductive metal oxide nor thermally evaporated metal electrodes.

Evaporable fullerene derivatives can be synthesized through cyclization and oxidation using fullerene cation intermediates. These fullerene derivatives are thermally stable up to 430 °C enabling the use for vacuum deposition processes which are widely used in industry.



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