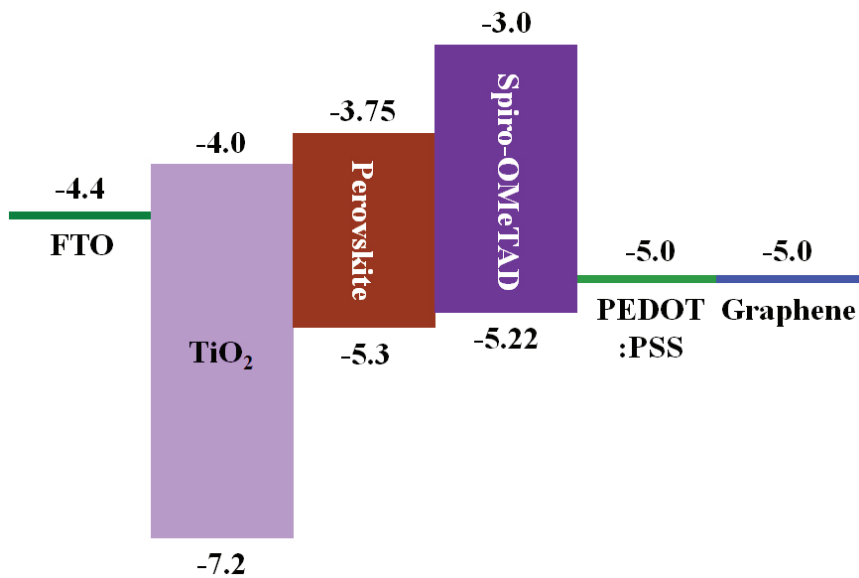
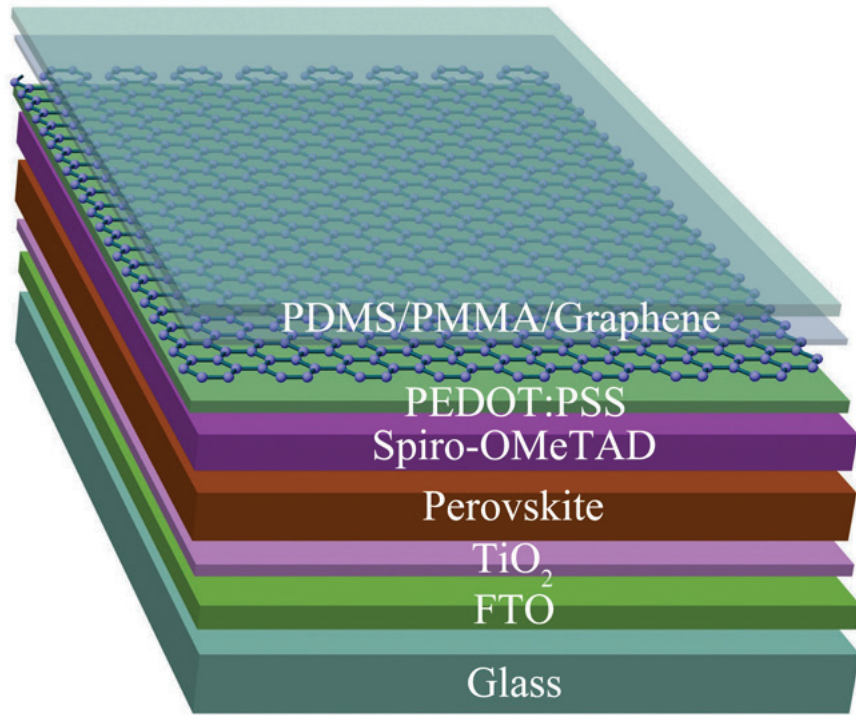


# High Efficient Semitransparent Perovskite Solar Cells

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Developing transparent or semitransparent solar cells with high efficiency and low cost has become increasingly important due to the increasing demands of the building integrated photovoltaics (BIPVs) systems. An efficient and low-cost semitransparent perovskite solar cells with graphene electrodes have been successfully developed. The power conversion efficiencies (PCEs) of this novel invention are around 12% when they are illuminated from fluorine-doped tin oxide (FTO) bottom electrodes or the graphene top electrodes, compared with 7% of conventional semitransparent solar cells. In addition, the semitransparent feature enables it to absorb light from both sides, and can be widely used in windows, facades, louvers and rooftops of buildings for converting solar energy into electricity, thus increasing the surface area for collecting solar energy substantially.