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Improving the performance through SPR effect by employing Au@SiO<sub>2</sub> core-shell nanoparticles incorporated TiO<sub>2</sub> scaffold in efficient hole transport material free perovskite solar cells

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## **Abstract**

Hole transport material free (HTM-free) perovskite solar cells (PSCs) with carbon counter electrode have the advantages of low-cost, good efficiency and high stability. Here in this work, we demonstrate that incorporating Au@SiO<sub>2</sub> core-shell NPs into TiO<sub>2</sub> scaffold layer increases the power conversion efficiencies (PCEs) of PSCs by improving the light absorption and facilitating carrier transfer or separation through SPR effect. With the optimal concentration of 0.3 wt % Au@SiO<sub>2</sub> incorporation, the average PCE of PSCs enhances to 13.85±0.45 % from the reference

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