Flexible bis(trifluoromethanesulfonyl)-amide -doped graphene transparent conducting electrodes for perovskite solar cell

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Organic-inorganic perovskite solar cells (PSCs) are of great interest because they can be manufactured in a large area, flexibility, low cost and light weight device. In recent years, interest in flexible electronic devices has increased as much as the stability of PSCs. To develop a flexible, stable, and high performance PScs requires an excellent transparent conducting electrode (TCE) with low sheet resistance, high transmittance, flexibility and high durability. Here, we fabricated doped graphene with low resistance, high transmittance, and long-term stability using a dopant of bis (trifluoromethanesulfonyl)-amide (TFSA). Due to the trade-off correlation between the sheet resistance and the transmittance of the TFSA-doped graphene TCE, the ratio of DC conductivity and optical conductivity was the highest at n_D = 20 mM. As a result, the power conversion efficiency (PCE) of the $FAPbI_{3-x}Br_x$ PSCs improved to 18.9/18.2 % for rigid/flexible substrate. We also showed excellent bending stability while keeping the original PCE above 90 % after 250 bending cycles at a bend radius exceeding 4 mm.