# Design of CoNi alloy/graphene as an efficient Pt-free counter electrode of dye-sensitized solar cells

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Platinum is known as the most preferred catalyst material for counter electrode (CE) of the dye-sensitized solar cells (DSCs). However, Pt suffers the most expensive material, results in limiting of large-scale application. We present here the synthesis of CoNi/graphene nanohybrid materials without toxic chemicals, under low temperature and atmospheric pressure conditions. The developed materials are effectively utilized as CE of the DSCs. For this purpose, we first designed an experimental approach for the co-reduction of metal precursor ions and graphene oxide via dry plasma reduction. The formation of CoNi alloy on graphene surface was confirmed by TEM and XRD. Morphology and the chemical state of developed CEs were determined by SEM and XPS, respectively. Electrochemical catalytic activity of the CEs was carefully investigated through EIS, CV and Tafel measurements. Finally, the effect of CEs on the efficiency of DSCs was further confirmed through analyzing J-V and IPCE performances. * This work was supported from Creative Human Resource Development Consortium for Fusion Technology of Functional Chemical/Bio Materials.