Pt-based alloy/graphene nanohybrid materials as a robust and efficient counter electrodes for dye-sensitized solar cells

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The replacement of expensive Pt counter electrode (CE) or decrease of Pt catalyst loadings, has been become a key issues in development of highly-efficient dye-sensitized solar cells (DSCs). We report here the experimental realization of stable CEs by immobilizing the Pt alloys with transition metals on graphene surface for enhanced CE properties. This work focuses on the systematic studies of dissolution engineering for Pt0.9M0.1/graphene (M=Au, Co, Cu, Fe, Mo, Ni, Pd, Ru, and Sn) CEs. The developed materials showed the higher catalytic activity as well as electrical conductivity in comparison with Pt/graphene CE. Furthermore, the results also indicated the improved stability of the developed CEs in iodide electrolyte. Thus, the Pt0.9M0.1/graphene nanohybrids can be considered as a low-cost alternative CE materials to the expensive Pt. The implementation of the Pt0.9M0.1/graphene nanohybrids offers a great potential for increasing the efficiency of DSCs.