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Mahmoud Samadpour, Shaghayegh Arabzade



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Graphene/CuS/PbS nanocomposite as an effective counter electrode for quantum dot sensitized solar cells

Mahmoud Samadpour^{*a}, Shaghayegh Arabzade^a

^aDepartment of Physics, K. N. Toosi University of Technology, PO Box 15418-49611, Tehran, Iran

^{*}Corresponding author: samadpour@kntu.ac.ir

Abstract:

In this paper, we introduce graphene/CuS/PbS nanocomposite as an effective counter electrode (CE) for quantum dot sensitized solar cells (QDSCs). The result indicated that the catalytic performance of CuS/PbS CEs was enhanced by pre deposition of graphene (G) sheets on the fluorine doped tin oxide (FTO) coated glass substrates. Here, various CEs are made by the simple successive ionic layer adsorption and reaction (SILAR) method. The result indicates that the fill factor of the cells with FTO/G/CuS/PbS CEs enhances in compare with the FTO/CuS/PbS CEs. Here, for the CdS/CdSe QD sensitized cells and G/CuS/PbS CEs, the cells' efficiency and fill factor is obtained 3.21 % and 0.51 respectively which is enhanced compared to the CuS/PbS CEs with 2.54 % efficiency and 0.36 fill factor. The present results indicate that the compact structure of the CuS/PbS CEs, replaces with a porous structure after graphene pre deposition which is expected to enhance the electrolyte/CE interface and consequently the fill factor. According to the obtained results, in spite of the poor catalytic activity of the graphene in the polysulfide electrolyte, it simply modifies the morphology of the CuS/PbS CEs for enhancing their performance. The results also demonstrated that G pre deposition can be systematically applied to enhance the performance of CEs in QDSCs.

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