

عنوان مقاله:

Fabrication of dye-sensitized solar cells based on the electrospun TiO₂nanofibres sensitized by the cocktail of natural dyes

محل انتشار:

دومین کنفرانس بین المللی کاربرد مواد و ساخت پیشرفته در صنایع (سال: 1401)

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خلاصه مقاله:

Here, we demonstrated that outstanding electrical and morphological characteristics of TiO₂ nanofibres sensitized by the cocktail of natural dyes can effectively improve and stabilize the dye-sensitized solar cells (DSSCs). The TiO₂ nanofibres were fabricated using a cost-effective and applicable electrospinning technique. The FESEM results demonstrated that the continuous bead-free nanofibres were successfully fabricated, which indicates good control of the electrospinning conditions. Based on the BET results, the transformation of nanoparticles to nanofibres increased the BET surface area and pore size. Then, a facile one-step approach was employed to fabricate TiO₂ nanofibres-based DSSCs that produced a highly porous network of TiO₂ without the nanofibre layer undergoing multiple cracks upon calcination. Based on the photovoltaic results, the DSSCs fabricated by the electrospun TiO₂ nanofibres showed the highest J_{sc} , V_{oc} , and η of ۱.۸۰ mA, ۰.۴۰ V, and ۱.۲۴%, respectively. This is because that the one-dimensional morphology of electrospun nanofibres provides better charge conduction due to the combined effect of the reduced grain boundaries and a higher specific surface area. The results also showed that the DSSC based on the TiO₂ nanofibres retained about ۶۳% of its initial efficiency after ۱۴ days, while DSSCs based on the TiO₂ nanoparticles maintained about ۲۷%, respectively.

کلمات کلیدی:

electrospinning, TiO₂ nanofibre, solar cell, natural dyes

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