Bio-derived stability

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Deoxyribose nucleic acid (DNA)–hexadecyl trimethyl ammonium chloride (CTMA) as the hole-transport layer in perovskite solar cells shows enhanced device efficiency as well as improved lifetime based on a p–i–n device structure. DNA-based devices exhibit device efficiency over 15% higher than that of the perovskite solar cells constructed with poly(3,4-ethylenedioxythiophene) polystyrene sulfonate (PEDOT:PSS) and maintained above 85% of their initial efficiency after 50 days in air.

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Processing optimization and characterization for PLA/MgAlCu-LDH/PVP composite microsphere

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In order to improve the mechanical properties of polylactic acid (PLA), PLA/MgAlCu-LDH/polyvinyl pyrrolidone (PVP) composite microsphere was successfully prepared on the basis of seminal emulson polymerization with PLA and PVP as monomer and MgAlCu-LDH as intercalating agent. Design-Expert 8.5 software was employed to optimize the processing technology in two steps. Firstly, single factor was analyzed based on the mass fraction ratio of MgAlCu-LDH to PLA, PVP concentration and stirring speed range being 1/15~1/8, 1~2%, 800~1200 r/min, respectively. Secondly, the interaction effects of three factors were discussed according to the analysis of the software. The results showed that influence factors to microspheres size were as follows: The stirring speed > the mass fraction ratio of MgAlCu-LDH to PLA > PVP concentration. The optimized processing technology of microspheres indicates that the mass fraction ratio of MgAlCu-LDH to PLA is 1/15, the concentration of PVP is 2%, the stirring rate is 1200 r/min. The structure and morphology of the dried frozen composite microsphere was characterized by XRD, FT-IR and SEM. The intercalation of part of the PLA into the gap of MgAlCu-LDH was responsible for the new peaks on XRD spectra of MgAlCu-LDH, and the disappearance peaks at 1750 cm^{-1}, 1200 cm^{-1} assigned to C=O on FT-IR spectra of PLA. This proves that PLA/ MgAlCu-LDH/PVP composite microsphere was successfully prepared. Interestingly, some tiny channels resulted from volatile solvent on the surface of microsphere which may be beneficial for biocompatibility.

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