

研究论文

聚3-甲基噻吩修饰量子点硫化铅连接TiO₂纳米结构膜的光电化学研究

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摘要 采用原位化学法在纳米结构TiO₂电极上制备了量子点PbS(Q-PbS), 并用电化学方法在TiO₂/Q-PbS表面聚合3-甲基噻吩[poly(3-Methylthiophene), PMeT]. 研究表明, PMeT和Q-PbS单独修饰纳米结构TiO₂电极和PMeT修饰Q-PbS连接纳米结构TiO₂电极的光电流产生的起始波长都向长波方向移动; 在可见光区光电转换效率均比纳米结构TiO₂的光电转换效率提高显著; PMeT与Q-PbS修饰的纳米结构TiO₂之间存在p-n异质结. 在一定条件下p-n异质结的存在有利于光生电子/空穴的分离, 提高了光电转换效率.

关键词 [量子点PbS](#) [聚3-甲基噻吩](#) [光电化学](#)

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Photoelectrochemical Study of Poly(3-methylthiophene) Modified Q-PbS Anchored Nanostructured TiO₂ Film

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Abstract The PbS quantum dots(Q-PbS) were formed in situ on a nanocrystalline TiO₂ electrode by using chemical bath deposition techniques and the PMeT were prepared with electrochemical method on TiO₂/Q-PbS film. The photoelectrochemical properties of TiO₂/Q-PbS film and poly(3-methylthiophene)(PMeT) modified Q-PbS anchored nanostructured TiO₂ film were studied by using the photocurrent action spectra and the photocurrent dependence of potential. The bandgap of Q-PbS films was 1.68 eV. The energy level of Q-PbS film was determined with photoelectrochemical method. The results indicate that PMeT and Q-PbS respectively modified TiO₂ film and PMeT modified Q-PbS anchored nanostructured TiO₂ film produced photocurrent in the longer wavelength region under a certain condition. In infrared light region, the conversion efficiency of light to electricity for the composite semiconductor nanoporous films was greatly improved comparing with that of the nanostructured TiO₂. The experiment result shows that the p-n heterojunction existed in the nanostructure TiO₂/Q-PbS/PMeT film electrode, which resulted in the separation of electron/hole pairs generated by photoexcitation, thus photoelectric conversion performance was improved.

Key words [PbS quantum dots](#) [Poly\(3-methylthiophene\)](#) [Photoelectrochemistry](#)

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