

论文

TiO<sub>2</sub>包覆不同微结构纳米碳纤维薄膜电极的光电化学性能

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摘要:

采用溶胶-凝胶法制备了TiO<sub>2</sub>包覆不同微结构的纳米碳纤维(Carbon nanofibers, CNF), 包括板式纳米碳纤维(Platelet-CNF, PCNF)和鱼骨式纳米碳纤维(Fish-bone-CNF, FCNF)的复合薄膜电极. 用光电流作用谱和光电流-电势图等方法研究了复合薄膜电极的光电化学性能. 研究表明, 复合薄膜电极表现出n型半导体特征, 薄膜中CNF的存在有助于光生电子和空穴有效地分离, 提高了光电转换效率, TiO<sub>2</sub>包覆PCNF薄膜电极在可见光范围内存在明显的光电响应.

关键词: TiO<sub>2</sub>复合薄膜电极 纳米碳纤维 光电化学 光电转换效率(IPCE)

Photoelectrochemical Properties of TiO<sub>2</sub> Coated on Carbon Nanofibers with Different Microstructure Film Electrodes

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Abstract:

Novel nanocomposites of TiO<sub>2</sub> and two kinds' carbon nanofibers with different microstructure were prepared by sol-gel method. The nanocomposites were studied *via* SEM, XRD, and photoelectrochemistry. The potential dependence of photocurrent and the photocurrent transients indicate that the nanocomposite shows characteristics of *n*-type semiconductor. The experimental results demonstrate that the PCNF/TiO<sub>2</sub> shows a higher photoelectrochemical response and sensitivity for visible light illumination than FCNF/TiO<sub>2</sub> and pristine TiO<sub>2</sub>. This is likely because of the specific microstructure of the PCNF, which possesses large numbers of active edge sites and provides many favorable sites for electron transfer as well as a very large working surface area. The significant enhancement of the photoelectrochemical response of the CNF toward visible light responses may result from the difference of their morphologies as well as their textural properties and crystalline structure. The results show that PCNF and FCNF are thus very promising candidates for developing a class of ideal and novel modified photoelectrodes.

Keywords: TiO<sub>2</sub> nanocomposite electrodes Carbon nanofibers Photoelectrochemistry IPCE

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