

### 论文摘要

中国有色金属学报

ZHONGGUO YOUSEJINSHUXUEBAO XUEBAO

第17卷 第9期 (总第102期) 2007年9月

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文章编号: 1004-0609(2007)09-1536-07

## 钴氮共掺杂TiO<sub>2</sub>薄膜的制备及其光电化学性质

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**摘要:** 采用溶胶-凝胶法分别制备未掺杂和钴掺杂TiO<sub>2</sub>溶胶, 室温下将其分别与三乙胺反应制得氮掺杂和(Co, N)共掺杂的TiO<sub>2</sub>溶胶, 然后通过浸渍-提拉法在钛片上成膜, 经烧结获得掺杂光电极。采用XRD、SEM、XPS和紫外-可见光谱和光电流作用谱等对电极进行表征, 并探讨其光电响应机理。结果表明: TiO<sub>2</sub>共掺杂后并未引起TiO<sub>2</sub>能带边缘位置发生明显改变, N主要以NO<sub>x</sub>形式掺杂; (Co, N)共掺杂TiO<sub>2</sub>薄膜电极的可见光响应比单掺杂的高, 这主要归因于共掺杂TiO<sub>2</sub>薄膜电极的比表面积增大、光吸收性能改善、界面电荷转移速率提高以及共掺杂元素的协同作用等。

**关键字:** TiO<sub>2</sub>薄膜; 钴氮共掺杂; 光电化学; 可见光

## Preparation of cobalt and nitrogen codoped TiO<sub>2</sub> thin films and their photoelectrochemical performance

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**Abstract:** The undoped and cobalt doped TiO<sub>2</sub> sols were prepared using sol-gel method. After addition of triethylamine into the respective sol at room temperature, nitrogen and (Co, N) codoped TiO<sub>2</sub> sols were obtained. Various thin film electrodes were prepared from the sols using dip-coating approach. These films were characterized by XRD, SEM, XPS, UV-Vis absorption spectroscopy and photocurrent action spectra, and their photoelectrochemical response mechanisms under visible light were also discussed. The results show that the (Co, N) codoped TiO<sub>2</sub> electrode exhibits an enhanced incident photon

to current efficiency under visible light in comparison with the Co-doped and N doped TiO<sub>2</sub> alone. Codoping dose not shift the position of energy band edges of the electrodes where nitrogen exists in the form of NO<sub>x</sub>. The enhanced photoresponse observed can be attributed to the increase in surface area, light absorbance, interface charge transfer rate of photogenerated carriers and cooperation effect between the doping species.

**Key words:** TiO<sub>2</sub> thin film; (Co, N) codoping; photoelectrochemistry; visible light

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