

研究论文

NaTaO₃及NaTaO₃: Bi³⁺光催化剂的光致发光光谱研究

石建英, 陈涛, 周国华, 冯兆池, 应品良, 李灿

中国科学院大连化学物理研究所, 催化基础国家重点实验室, 大连 116023

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摘要 采用光致发光光谱技术对一系列不同条件下制备的NaTaO₃及不同掺杂量的NaTaO₃: Bi³⁺进行了研究。结果表明, NaTaO₃的发光性质与其制备条件密切相关: 在钠离子不足条件下合成的样品, 其发光带主要位于515和745 nm左右; 而在钠离子充足条件下合成的样品, 其发光带位于460 nm左右, 随着 $n(\text{Na})/n(\text{Ta})$ 的降低, 发光带向长波长方向移动; 掺入Bi³⁺之后, 其发光峰由515 nm移至455 nm, 随着Bi³⁺掺入量的增加, 455 nm的发光带强度减弱。515 nm的发光带与替位缺陷Ta_{Na}...相关; 745 nm的发光带与V_{Na}、缺陷相关; 而460 nm的发光带与本征TaO₆基团相关。将Bi³⁺掺入到钽酸钠样品, Ta_{Na}...由Bi_{Na}..替代, 相应的发光带向高的 $n(\text{Na})/n(\text{Ta})$ 方向移动, 从而呈现出本征TaO₆基团的发光带。

关键词 [光致发光光谱](#) [NaTaO₃](#) [NaTaO₃: Bi³⁺](#)

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Photoluminescence Spectroscopy of NaTaO₃ and NaTaO₃: Bi³⁺ Photocatalysts

SHI Jian-Ying, CHEN Tao, ZHOU Guo-Hua, FENG Zhao-Chi, YING Pin-Liang, LI Can*

State Key Laboratory of Catalysis, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian 116023, China

Abstract NaTaO₃ and Bi³⁺ doped NaTaO₃ were prepared by conventional high temperature solid state reactions and characterized by the photoluminescence spectroscopy. The luminescence characterization of NaTaO₃ is sensitive to its preparation condition. Under the condition of Na scarcity, two luminescence bands of 515 nm and 745 nm are observed in the photoluminescence spectra, which are ascribed to the antisite defects of Ta_{Na}... and V_{Na} defects, respectively. Under the condition of Na enough, the luminescence band shifts to about 460 nm, which are originated from the intrinsic tantalate groups. The introduction of Bi³⁺ causes the emission band shifts from 515 to 455 nm, namely, the Ta_{Na}... defects are replaced by Bi_{Na}.. defects and the luminescence characterization of NaTaO₃ is shift to the direction of a higher $n(\text{Na})/n(\text{Ta})$ ratio. The present work also demonstrates that the photoluminescence spectroscopy is a powerful technique to characterize the defect chemistry in semiconductor materials and it is especially useful in the study of photocatalysts.

Key words [Photoluminescence spectroscopy](#) [NaTaO₃](#) [NaTaO₃: Bi³⁺](#)

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