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Full Papers

纳米TiO_2膜用于光催化氧化测定化学需氧量的研究

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摘要 提出了一种基于纳米TiO_2–$Ce(SO_4)_2$共存体系光催化氧化，电化学检测化学需氧量（COD）的新方法。该方法用$Ce(SO_4)_2$作为纳米TiO_2膜光生电子的接受体，减少纳米TiO_2光生电子和光生空穴的复合，提高纳米TiO_2的光催化氧化有机物的能力。体系中$Ce(SO_4)_2$得电子后的还原产物Ce（III）在多壁碳纳米管（MWNT）膜修饰电极上电流响应值与COD呈一定的比例关系。本文探讨了光催化氧化测定COD的机理，考察了测定COD的最佳反应条件。实验结果表明，该方法条件温和，不会造成二次污染，能够实现地表水、工业污水等多种COD值的快速准确测定，COD值的测定范围为1～600mg mg·L^{-1}，检测限为0.5mg·L^{-1}。将该方法用于实际水样的检测，测定结果与COD标准分析法有较好的一致性。

关键词 光催化氧化, 化学需氧量, 电化学检测, 纳米TiO_2膜

分类号

Photocatalytic Oxidation for Determination of Chemical Oxygen Demand Using Nano-TiO_2 Film

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Abstract A photocatalytic oxidation method for determination of chemical oxygen demand (COD) using nano-TiO_2 film, based on the use of a nano-TiO_2-$Ce(SO_4)_2$ system and electrochemical detection, was proposed. The technique was originated from the direct determination of the Ce(III) concentration change resulting from photocatalytic oxidation of organic compounds. Ce(III), which was produced by photocatalytic reduction of $Ce(SO_4)_2$, could be measured at a multi-walled carbon nanotubes (MWNT) chemically modified electrode (CME). The COD values by this method were calculated from the differential pulse voltammetry (DPV) current of Ce(III) at the CME. Under the optimal operation conditions, the detection limit of 0.5 mg•L^{-1} COD with the linear range of 1—600 mg•L^{-1} was achieved. This method was also applied to determination of various COD of ground water and wastewater samples. The results were in good agreement with those from the conventional COD methods, *i.e.*, permanganate and dichromate ones.

Key words photocatalytic oxidation chemical oxygen demand electrochemical detection nano-TiO_2 film

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