Short Communication

Electrochemical Determination of Chemical Oxygen Demand Using Ti/TiO₂ Electrode

Yongxian Ge¹, Yufang Zhai¹, Dun Niu^{1,*}, Yuhong Wang¹, Carlos Fernandez³,
Thippeswamy Ramakrishnappa⁴, Xiaomin Hu², Linshan Wang^{1,*}

¹ College of Sciences, Northeastern University, Shenyang 110819, China.

² College of Resources and Civil Engineering, Northeastern University, Shenyang 110819, China.

³ School of Pharmacy and Life Sciences, Robert Gordon University, Garthdee Road, Sir Ian Wood Building, Aberdeen AB107GJ, UK.

⁴ Center for Nano and Material Science, Global Campus, Jain University, Jakkasandra (P), Kankapura (T), 560001 Bangalore, Karnataka, India

*E-mail: lswang@mail.neu.edu.cn, niudun666@hotmail.com

doi: 10.20964/2016.12.05

Received: 31 August 2016 / Accepted: 26 September 2016 / Published: 10 November 2016

To overcome the shortcomings of the conventional potassium dichromate method (PDM) for monitoring chemical oxygen demand (COD) of waters, many efforts have been made on developing quick and environment-friendly techniques. Among all alternatives, electrochemical (EC) techniques are very competitive due to their relatively simple devices and quickness. A number of electrodes have been fabricated to investigate electrochemical determination of COD. However, little work has been reported on TiO₂ based electrode for this purpose. In the present work, Ti/TiO₂ electrode was simply prepared by anodic oxidation of pure titanium. Aqueous solutions of potassium hydrogen phthalate and phenol were electrolyzed by chronocoulometry in a three-electrode system with Ti/TiO₂ as working electrode (anode). Organic compounds were electrochemically oxidized on Ti/TiO₂ electrode by hydroxyl radicals and the released electrons were recorded and transferred to currents. The electric currents were proportional to the COD values of the water samples being investigated. Based on data of COD values and corresponding currents, a linear regression equation was obtained for a certain kind of waste water. With the regression equation, current of an unknown water sample was transferred to its COD value. Conditions for the presented EC method were set up as cell voltage 2.0V *v.s.* SCE and pH 7.0. The linear range of COD was of about 25~530 mg/L. COD values of real waste water samples were measured by Ti/TiO₂ electrode and the relative errors were all in the range of $\pm 8\%$ compared with data determined by conventional PDM. The electrochemical methodology was successfully applied to evaluate COD in waste water..

Keywords: Ti/TiO₂ electrode; anodic oxidation; chemical oxygen demand; chronocoulometry

[FULL TEXT](#)

© 2016 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).