Acetic Acid Sensor Using Diamond-Like Carbon as Working Electrode for Disinfection and Sterilization Industry

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As disinfection and sterilization technology advances, peracetic acid(PAA) has received increasing attention as a strong antimicrobial agent with a wide spectrum of antimicrobial activity [1,2]. PAA is especially impressing with its effective disinfection at room temperature, easy technical preparation and environmental benignity, yet the great dependence on acetic acid leads to the increases of organic content in the effluent. Therefore, a detection of acetic acid is accordingly required to ensure the safety of wastewater as well as to locate the depletion level of PAA. Since the bare up-to-the-minute papers about acetic acid sensing are exclusively based on immobilized enzyme which is unstable and expensive, another quick and convenient electrochemical method was studied and has been successfully realized in this work.

Electrochemical sensing of acetic acid is achieved using diamond-like carbon as working electrode in sodium citrate solutions. Figure 1 shows the cyclicvoltammograms at diamond-like carbon electrode without, with 0.01M, and with 0.02M acetic acid. The acetic acid signals take place in the potential range from -0.5 to -1.1V vs. Ag/AgCl, within which a working potential at -0.75V vs. Ag/AgCl was verified to have the best performance. Concentrations of acetic acid were amperometrically determined when potential applied at -0.75V vs. Ag/AgCl as shown in Figure 2. Time response upon adding 200ppm acetic acid per 10 minutes was carried out. However, the system needs further modification and optimization to approach better sensitivity. The mechanism of the electrochemical reactions is under way to determine the macrocosm operation of the sensing system.

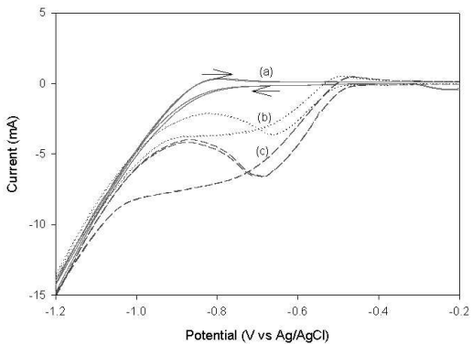

Fig1. Cyclicvoltammograms at a diamond-like carbon electrode in 0.1M sodium citrate solutions and different concentrations of acetic acid: 0.0M acetic acid(a), 0.01M acetic acid, and(b) 0.02M acetic acid(c) at potential scan rate 20mV/s on the 5th and 6th cycles.

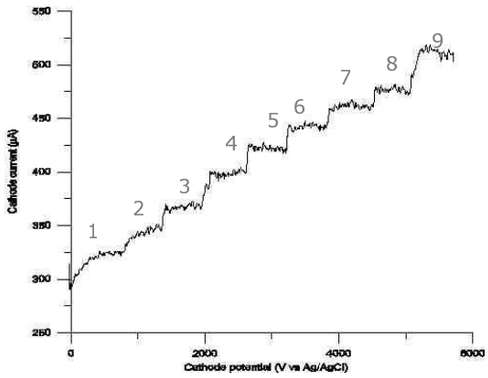

Fig2. (a) Time response curve of a diamond-like carbon electrode in 0.1M sodium citrate solution at the applied potential of -0.75V with increasing acetic acid concentration step-increased per 10 minutes: (1)0ppm (2)200ppm (3)400ppm (4)600ppm (5)800ppm (6)1000ppm (7)1200ppm (8)1400ppm (9)1600ppm and

References

[1] M. Kitis, Environment International 30 (2004) 47-55.
[2] S. Stampi, G. De Luca, M. Onorato, E. Ambrogiani and F. Zanetti, Journal of Applied Microbiology 93 (2002) 725-731