Quantitative real-time and tunable band gap of deoxidization of graphene oxide using electrochemical surface plasmon resonance technology

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Abstract

Surface plasma resonance (SPR) technology is capable of detecting changes in refractive index near the surface of dielectric-metal interface. This paper used SPR technology real-time detection deoxidization process of graphene oxide (GO) converted to reduced graphene oxide (rGO) by electrochemical method. The GO is a novel material with almost unlimited potential, which can be inexpensively produced. The hydrophilic affinity of GO, owing to the oxygen functional groups, makes it easily dispersible in water and other organic solvents. The excellent physical and chemical properties of this compound are very important when it is mixed with nanoparticles or polymer matrices to improve their electrical and optical properties. [1]. GO has a wide range of applications in the fields of biology [2], protecting against bacteria [3], water purification [4] and biosensors [5]. In this study, we have three different experimental methods to reduction GO, Experiment I：Used cyclic voltammetry (CV) reduction GO film；Experiment II：Used constant voltage reduction GO film；Experiment III：Used CV reduction GO mixed solution. The first two experiments used cysteamine (Cys) connection a gold film and GO layer to form a stable covalent GO film. The third experiment, GO solution is mixed with NaCl electrolyte to form a mixed solution of GO and reduction by CV. We will analysis the rGO film by X-ray photoelectron spectroscopy (XPS) and Raman spectroscopy. Then, we can use of XPS results with Essential Macleod simulation software to calculate the rGO refractive index. Experimental results demonstrate that the electrochemical surface plasmon resonance (EC-SPR) signal can quantitatively detect in real time and tunable C/O ratios. In constant voltage method, GO converts to rGO changes the C/O ratio from 4.10 into 71.41 and refractive index changes from 1.7 + *i*0.17 to 1.83 + *i*0.42. While the mixed solution of GO can tunable luminescence wavelength from 470~600 nm by CV method.

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