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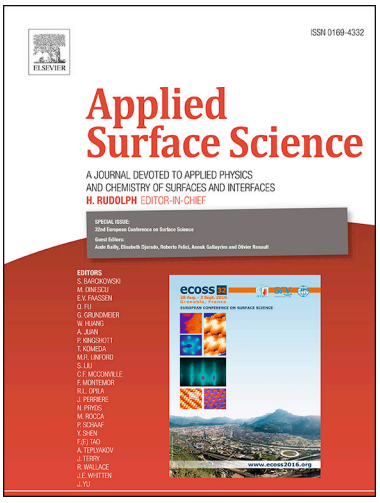

Full Length Article

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Tailoring properties of reduced graphene oxide by oxygen plasma treatment

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Abstract

We report an easily controllable, eco-friendly method for tailoring the properties of reduced graphene oxide (rGO) by means of oxygen plasma. The effect of oxygen plasma treatment time (1, 5 and 10 minutes) on the surface properties of rGO was evaluated. Physicochemical characterization using microscopic, spectroscopic and thermal techniques was performed. The results revealed that different oxygen-containing groups (e.g. carboxyl, hydroxyl) were introduced on the rGO surface enhancing its wettability. Furthermore, upon longer treatment time, other functionalities were created (e.g. quinones, lactones). Moreover, external surface of rGO was partially etched resulting in an increase of the material surface area and porosity. Finally, the oxygen plasma-treated rGO electrodes with bilirubin oxidase were tested for oxygen reduction reaction. The study showed that rGO treated for 10 min exhibited twofold higher current density than untreated rGO. The oxygen plasma treatment may improve the enzyme adsorption on rGO electrodes by introduction of oxygen moieties and increasing the porosity.

Keywords: *reduced graphene oxide; oxygen plasma treatment; surface engineering; wettability; bilirubin oxidase adsorption; enzyme electrode.*

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