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Controlling Oxidation level of Graphene/Graphene Oxide by Solution Plasma from the Exfoliation of Graphite Oxide

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Oxidation level provides tunability of electronic, optical, and mechanical properties of graphene/graphene oxide structures. Graphene sheets with tunable oxidation level already suggest new vistas and promisingly hold the benefits to novel sensors, membrane-based NEMS devices, transparent conductors for optoelectronic applications, and smart composite materials. Solution plasma process (SPP) which is a new plasma system where has been widely utilized in nanomaterial synthesis, surface modification, water treatment, sterilization, and decomposition of organic compound, is one of the fastest and easiest tools to control oxidation level. The reaction fields, oxidation and reduction from solution plasma can be controlled via the adjusted discharge condition. In the modification of materials, SPP can be employed for material modification and provide the special function, by introducing functional group for example amino group to carbon nanotube structure. Here, SPP is utilized to control the oxidation level of graphene/graphene oxide. The as-synthesized graphite oxide is synthezied from Marcano's method and used as the precursor for graphene/graphene oxide. Graphite oxide is SPP-treated under different plasma phenomena to control the oxidation level and the treated samples are exfoliated by thermal process for a few minutes (1-3 min) to improve the production yield of graphene/graphene oxide. The oxidation level of graphene/graphene oxide is characterized via FTIR and ESR. The graphene/graphene oxide nanostructure is investigated by TEM and Raman spectroscopy. The modification on the controllable oxidation level of graphene/graphene oxide to promote the active site in oxygen reduction reaction electrocatalysis is focused for potential application in fuel cell system.