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Preparation of oxygen functional groups controlled-graphene oxide quantum dots through photo-thermal reduction process

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Quantum dots (QDs) have been attracting considerable interest for both fundamental researches and industrial development due to their spectral and size tenability. They have been ideal candidates for tunable light emitters in various applications such as biological imaging, lasers, light-emitting diodes, and optical amplifiers. Narrowly size distributed QDs with photostability are required to meet the application quality. Synthesis of graphene oxide quantum dots (GOQDs) have been studied intensively as their characteristic property led to wide applications in photovoltaic cells, ultracapacitors, and biosensor. Especially, non-toxic GOQDs are potential material in the field of medicine and biology.

GOQDs with different oxygen content and types were prepared through the photo-thermal reduction process in this work. The oxygen-containing functional groups such as epoxy, hydroxyl, carboxylic, and carboxyl groups are one of the crucial elements for determining the optical properties of GOQDs. Here we report the synthesis of GOQDs through the photo-thermal reduction process with the intense pulsed light (IPL) which decomposes the oxygen-containing functional groups as irradiation energy density varied. Photoluminescence of the photo-thermally reduced GOQDs exhibited a blue shift, which can be explained with decomposition of the oxygen-containing functional groups at the surface of GOQDs. The physical and optical properties were investigated by using Raman spectroscopy, x-ray photoelectron spectroscopy, photoluminescence, UV-vis spectroscopy, and time-resolved photoluminescence. This result suggests that the photo-thermal process with IPL provides an effective reduction of the oxygen-containing functional groups at the surface of GOQDs.

Biography

Imjeong Ho-Soon Yang has completed her PhD from University of Georgia, USA and postdoctoral studies from Argonne National Laboratory. She is the professor at Deptartment of Physics, Pusan National University, Korea. She has published more than 75 papers in reputed journals.

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