Photoluminescence from graphene oxide quantum dots via intense pulsed light

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Graphene oxide quantum dots (GOQDs) are two-dimensional carbonic material, having a lateral size of a few nanometers and a one-atom-thickness. Due to their exceptional properties such as the stable photoluminescence (PL), pronounced quantum confinement effect, good chemical stability, and low toxicity, GQDs are considered as one of novel candidate materials for bioimaging, biomedicine, and optoelectronics. GOQDs was fabricated from single-walled carbon nanotubes through chlorate-based oxidation and separation after acoustic cavitation with an average lateral diameter of 3.37 nm and a size deviation of ±0.1 nm. Subsequently, photo-reduced GOQDs (P-rGOQDs) were obtained by liquid-phase photoreduction of the GOQD suspension under intense pulsed light irradiation. Liquid-phase photoreduction selectively reduced epoxy groups present on the basal plane of GOQDs, and hydrogenated the basal plane without removal of carbonyl and carboxyl groups at the edges of the GOQDs. Such selective removal of oxidative functional groups was used to control the reduction degree of GOQDs, closely related to their optical properties. The optimized P-rGOQDs were bright blue in color and showed quantum yields up to about 19.7%, which was 10 times the quantum yield of GOQDs, which reveals that the P-rGOQDs have the potential to be used in the fields of bioimaging, biomedicine, and optoelectronics.

References

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Figures

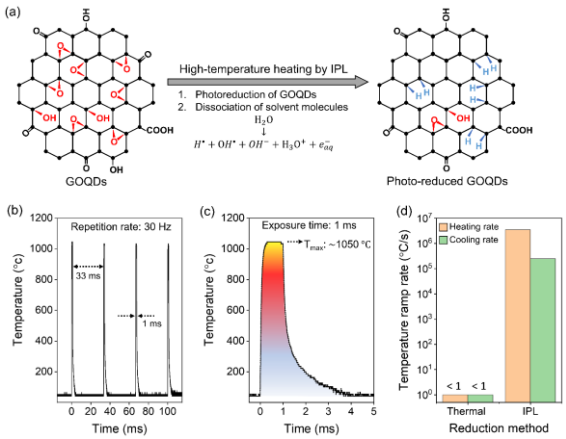

Fig 1. (a) the photoreduction process of GOQDs suspension in ambient air. (b) *In situ* monitoring of temperature change of GOQDs powder during multiple-pulses IPL irradiation. (c) Temperature-time profile of GOQDs powder for single pulse (d) Heating and cooling rates of thermal and IPL treatment.