

8th International Conference and Exhibition on

LASERS, OPTICS & PHOTONICS

November 15-17, 2017 | Las Vegas, USA

White graphene quantum dots surface coated with MnO₂ nanosheet for dual imaging guided photothermal therapy

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Recently white-light emitting materials have gained significant attention for diverse applications, optoelectronic, biological and others. In this study, we synthesized white-light-emitting graphene quantum dots (WGQDs) from organic sources and investigated dual imaging guided photo therapeutic effects. We have characterized our WGQD with a diameter around 20 nm by FESEM and TEM and found 3-5 graphene layers by AFM. Our results demonstrate that the developed WGQDs display enhanced intracellular and cellular uptake with multi-channel intracellular fluorescence in all three primitive channels (blue, green and red). Moreover, the developed WGQDs displayed multi-channel imaging *in vivo* along with enhanced tumor homing properties. After that, WGQDs were surface coated with manganese oxide (WGQD-MnO₂) and then investigated MRI effects and photo thermal effects. Our studies showed that WGQD-MnO₂ nanoparticles showed positive contrast effects due to manganese oxide. WGQD-MnO₂ nanoparticles increased 25°C upon irradiation of laser at 2 W/cm² for *in vitro* and *in vivo* respectively. In another hand, WGQDs increased 25°C upon irradiation of laser. WGQD-MnO₂ nanoparticles exhibited enhanced photothermal effects on cancer *in vitro* and *in vivo*, respectively than WGQDs only. Finally, these nanoparticles could enhance tumor therapeutic efficacy guided with proper diagnostics.

Biography

Yong-Kyu Lee has completed his PhD from Gwangju Institute of Science and Technology and Post-doctoral studies from Georgia Institute of Technology Department of Biomedical Engineering (USA). He is the Professor/Director of Chemical & Biological Engineering and 4D Biomaterial Research Center. He has published more than 100 papers in reputed journals and 30 registered patents (corresponding author).

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