

# Near-Infrared Photothermal Therapy Cancer Treatment Assisted with Graphene-Based Materials <sup>†</sup>

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**Abstract:** Photothermal therapy is an emerging method of cancer treatment in which tumors are ablated by heating agents using near-infrared light (700–1000 nm). A semiconductor with a bandgap between 0.3–0.7 eV would, therefore, efficiently emit near-infrared light. The new “magic” material graphene has a bandgap of zero, which is advantageous with regard to designing a new material with a suitable bandgap for the emission of near-infrared light. In our investigations, using the first-principles density functional theory calculation method, we aimed to and successfully designed graphene-based materials with a direct bandgap of 0.68 eV. They have the potential to be optimal and efficient near-infrared light sources due to their narrow yet fitting bandgap. The present results open up a new avenue for the application of graphene-based materials to assist in photothermal therapy.

**Keywords:** biomedical engineering; materials chemistry; materials science; oncology; physical chemistry; photothermal therapy; bandgap; graphene; first principle calculation.

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## Conflicts of Interest

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