

## Graphene and graphene oxide for biomedical applications: From stem cell manipulation to antimicrobial applications

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### Abstract

Among its carbon counterparts, graphene (G) and graphene oxide (GO) display superior functionalities arising from their versatility to tune their electronic, electrochemical, optical, mechanical and thermal properties simply by modifying their lateral dimension, number of layers, stiffness, defect density and chemical composition. However, G and graphene oxide (GO) can also be easily functionalized with various biomolecules and this has led to numerous graphene-related biomedical applications [1-11]. Here we will demonstrate how G and GO can enable us to design and create substrates that can concentrate induction factors thus enabling us to manipulate stem cell fate. Here, the synergy of the unique capability of G and GO and differentiation potential of stem cells can provide exciting opportunities for new and novel therapeutic applications. We will also showcase how the molecular hemocompatibility of G and GO coatings can enable us to endow medical devices with antimicrobial and antithrombotic properties. This is especially useful for devices that have direct and prolonged contact with bodily fluids such as blood or urine. In fact, one of the causes of patient morbidity and mortality is infection and this can arise from prolonged use of invasive medical devices such as catheters. We will explore how G and GO coatings can play their part in minimizing such occurrences.

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