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A comparison of graphene and graphene oxide fibers in antimicrobial applications

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Airborne and waterborne diseases, caused by the inhalation, ingestion or absorption of pathogenic microorganisms, pose a serious threat to human health. Functionalization of polymeric fibres with antimicrobial agents is an attractive strategy to overcome these concerns. Graphene and graphene oxide have presented themselves as promising materials for the inhibition of bacterial colonization. Here we fabricated a novel class of ultra-thin polymeric fibres loaded with either 2, 4, or 8 wt% of graphene or graphene oxide nanoparticles using pressurized gyration. Electron Microscopy was used to characterize graphene and graphene oxide nanoparticles, as well as fibre morphology. Scanning Electron Microscopy revealed the formation of beaded porous fibres. The concentration of carbon nanoparticles in the composite was found to dictate fibre morphology. As the concentration increased, the average fibre diameter increased, whilst fibre porosity decreased. The antimicrobial activity of these nanocomposite fibres was assessed against both Gram-negative and Gram-positive bacteria. Pure polymer fibres were used as the negative control. The fibres were incubated in bacterial suspensions for 24 hours at 37°C; bacterial colony forming units were enumerated by adopting the colony counting method. The presence of 2 and 4 wt% graphene loaded fibres promoted microbial growth, whilst 8 wt% graphene loaded fibres showed antimicrobial activity. 2, 4 and 8 wt% graphene oxide loaded fibres exhibited excellent antibacterial activities with bacterial reductions of 45%, 70% and 85%, respectively. The results presented in this research have identified a novel application of carbon based hybrid materials.

Biography

Rupy Kaur Matharu has completed her Bachelor's degree in Biomedical Sciences with a first-class honours and her Master's degree in Biomaterials and Tissue Engineering with a distinction. She was awarded the Dean's List for her academic achievement during her Master's degree, where she received 92% for her independent research. She is currently in her second year of doctoral studies at University College London, in which she is focusing on the production of antimicrobial fibres for air and water filtration systems.

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