Graphene quantum dots for multiphoton imaging and drug delivery

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Abstract

Harnessing biocompatible and photostable fluorescent probes are crucial for visualising and tracking biological functions and interactions inside living organisms over extended periods of time. We report the synthesis and application of highly biocompatible graphene quantum dots for simultaneous cell and scaffold imaging. The quantum dots were synthesised from a natural protein material under green and controlled conditions in a hydrothermal reactor [1-3].

Our investigations revealed the unique physicochemical characteristics, high quantum yield and intense fluorescence derived from the carbogenic core of the quantum dots. The bioimaging of cells embedded in a 3D printed scaffold demonstrated that the quantum dots can enable deep tissue imaging under biomimetic conditions. Real-time videography and cell viability tests showed excellent visualisation, photostability and robustness of these organic quantum dots for long-term cell imaging using multi-photon microscopy (Figure 1).

Cell viability and drug delivery results showed that the quantum dots are able to provide a biocompatible medium with the capabilities of monitoring the system through imaging and the delivery of medication to the desired region for effective treatment of tumours and affiliated diseases.

References

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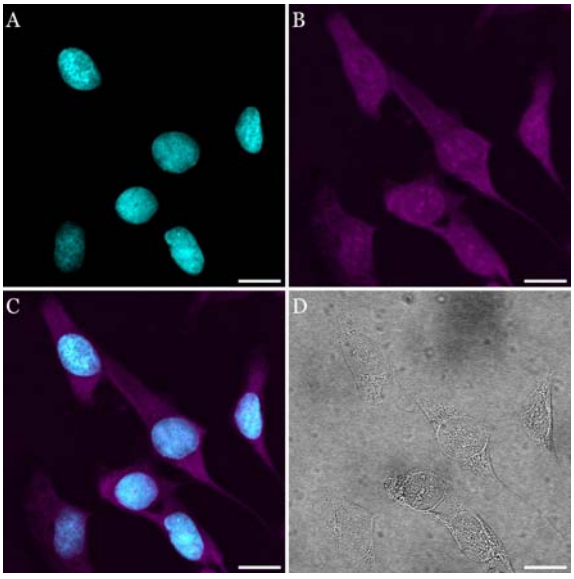

Figure 1: Two photon cell imaging with quantum dots under 780 nm pulsed laser