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Emerging Quantum Dots from 2D materials for Biomedical Applications

Biocompatible and photostable probes are crucial for visualising and tracking biological functions and interactions, crucial for regenerative medicine and tissue engineering. We report the synthesis and applications of highly biocompatible 2D material based quantum dots for simultaneous cell and scaffold imaging. The quantum dots are synthesised from natural precursors under green and controlled conditions in hydrothermal reactors.

Our investigations reveal the unique physicochemical characteristics, high quantum yield and intense fluorescence derived from the carbogenic core of the quantum dots. The bioimaging of cells in a 3D printed scaffold demonstrate that the quantum dots 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. Drug delivery results showed that the quantum dots are able to provide a biocompatible medium with the monitoring capabilities through imaging and delivery of medication to the desired region for treatment.