

عنوان مقاله:

Upconversion Nanoparticles: Biological Applications

محل انتشار:

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خلاصه مقاله:

Upconversion nanoparticles (UCNs) are a recent class of fluorophore that incorporate physico-chemical principles to enhance low-energy photons to higher energy levels. As new luminescent nanomaterials, upconversion nanoparticles demonstrate superior properties compared to conventional fluorophores, including large signal-to-noise ratio and high photo stability. Additionally, as these particles have near-infrared excitation wavelengths, they present further advantages, including deep tissue penetration and low photodamage to biological specimens. Upconversion was first introduced in the ۱۹۶۰s, and soon received widespread attention due to its various optical applications, including infrared quantum counter detectors and compact solid-state lasers. In recent years, preparing high-quality lanthanide-doped nanoparticles is turning into a usual procedure, emphasizing the importance of upconversion in biological science and practices. Upconversion nanoparticles are biocompatible and small in size; therefore, they can readily be coupled to proteins or other biological macromolecular systems and implemented in several assay formats, from bio-detection to cancer treatment. Also, the intense visible emissions generated by upconversion nanoparticles under near-infrared excitation are more penetrative and less biologically damaging compared to ultraviolet excitation currently in use. This makes these particles excellent candidates as cent stains for bio-imaging processes. The present review investigates new aspects of UCNs in terms of definition, development, and application and their use in targeted drug delivery, bioimaging, detection, and Photodynamic Therapy (PDT) and focuses on the approaches employed in the process.

کلمات کلیدی:

Upconversion nanoparticles, Photodynamic Therapy, Imaging, Detection, Drug Delivery

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