Design and Performance Optimization of Multifunctional Photosensitizer Based on Semiconductor

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Photosensitizer (PS) play a crucial role in the process of photodynamic therapy (PDT), but the limited tissue penetration depth of excitation light sources within the ultraviolet and visible light range of the traditional organic photosensitizer Ce6, ZnPc and RB seriously affect their applications. In recent years, inorganic narrow-bandgap semiconductors have been widely explored as PS because they not only generate ROS by directly absorbing near-infrared (NIR) light to increasing tissue penetration depth but also exhibit physical and chemical stability. However, the rapid combination of photogenerated charges and low production rate of reactive oxygen species (ROS) of narrow band semiconductor promote the development of PS based on heterojunction through combining with other semiconductor, which can not only accelerate the separation and transfer of photogenerated charges to improve the production of ROS but also convert part of absorbed NIR light into heat to achieve photothermal therapy (PTT) and PDT synergistic therapy. To achieve precise non-invasive treatment, NIR-to-NIR nano-thermometers based on rare-earth fluorescence lifetime were introduced to realize the real-time and accurate temperature detection of PTT process, which is not affected by tissue absorption and scattering in comparison with fluorescence intensity ratio (FIR) thermometric technology. By combining heterojunction with thermometers to design and fabricated a multifunctional photosensitizer based on heterojunction.

Short Bio:

Chongfeng Guo received his PhD degree in Inorganic Chemistry from Sun Yat-sen University, China. He is a full professor of Institute of Photonics & Photon-Technology at Northwestern University, China.