

Short-wave infrared emissive nanomaterials for biomedical applications

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Short-wave infrared (SWIR), usually defined as an optical window ranging from 850 to 1700 nm, pertains several advantages over visible and near infrared for deep tissue imaging. It penetrates the tissues deeper, is scattered by the tissues less, and is less likely to induce tissue autofluorescence. In the past decade, scientists have demonstrated its great advantages for the use in fluorescence imaging in vivo, but the ideal fluorophore in this wavelength range has not been developed yet. In this talk, I will briefly introduce the optical properties of single-wall carbon nanotubes (SWCNTs) and how to manipulate SWCNTs for better imaging performance.¹ I will also show our recent studies of the advanced surface modifications of the SWCNTs and their effects to the biological systems. Another important topic is related to enantiomeric effects of the SWCNTs in biological system. Our initial results demonstrate nano-enantiomericity plays significant roles to the immune cell responses. Finally, I will show a SWIR up-conversion imaging modality using plasmon-enhanced organic dyes.²

1 Lin, C.-W. *et al.* Creating fluorescent quantum defects in carbon nanotubes using hypochlorite and light. *Nat. Commun.* **10**, 2874, (2019).

2 Lin, C.-W. *et al.* Surface Plasmon Enhanced Upconversion Fluorescence in Short-Wave Infrared for In Vivo Imaging of Ovarian Cancer. *ACS Nano* **16**, 12930-12940, (2022).