Near-infrared-sensitive nanomaterials based on photoresponsive Ru complexes for deep-tissue biomedical applications

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The near-infrared (NIR) region of the spectrum is called “therapeutic window” because NIR light can penetrate deeply into tissue. In this talk, I will present constructing of NIR-responsive nanomaterials based on photoresponsive Ru complexes. My talk contains two parts.

In the first part, I will show fabrication of NIR-responsive nanomaterials by combination of upconverting nanoparticles (UCNPs) and photoresponsive Ru complexes. UCNPs convert NIR light to visible light that can trigger photocleavage of Ru complexes. We used Ru-complex-functionalized UCNPs for drug delivery and controlling protein adsorption on implants.

In the second part, I will introduce the synthesis and self-assembly of red-light-responsive Ru-containing block copolymers (BCPs) and their applications in anticancer phototherapy. The Ru complexes in the BCPs act as light-cleavable moieties, singlet oxygen sensitizers and anticancer agents. Depending on the molecular weight and chemical structure of the Ru-containing BCPs, the BCPs assembled into micelles, vesicles, large compound micelles and other nanostructures. Some of the BCP assemblies can also carry commercial anticancer drugs such as doxorubicin. The BCP assemblies can be taken up by cancer cells. Red light can pass through tissue and activate the Ru-containing BCP assemblies. The photoactivated Ru-containing BCP assemblies can inhibit the growth of cancer cells in deep tissue. Photoresponsive Ru-containing BCPs provide a new platform for deep-tissue phototherapy.

References

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