Hollow Gold Nanotubes with Controlled Length and Near-Infrared Absorption for Theranostic Applications

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Abstract (Calibri 8)

Important aspects in engineering gold nanoparticles for theranostic applications include the control of size, optical properties, cytotoxicity, biodistribution, and clearance. In this study, gold nanotubes with controlled length and tunable absorption in the near-infrared (NIR) region have been exploited for applications as photothermal conversion agents and in vivo photoacoustic imaging contrast agents. A length-controlled synthesis has been developed to fabricate gold nanotubes (NTs) with well-defi ned shape (i.e., inner void and open ends), high crystallinity, and tunable NIR surface plasmon resonance. A coating of poly(sodium 4-styrenesulfonate) (PSS) endows the nanotubes with colloidal stability and low cytotoxicity. The PSS-coated Au NTs have the following characteristics: i) cellular uptake by colorectal cancer cells and macrophage cells, ii) photothermal ablation of cancer cells using single wavelength pulse laser irradiation, iii) excellent in vivo photoacoustic signal generation capability and accumulation at the tumor site, iv) hepatobiliary clearance within 72 h postintravenous injection. These results demonstrate that these PSS-coated Au NTs have the ideal attributes to develop their potential as effective and safe in vivo imaging nanoprobes, photothermal conversion agents, and drug delivery vehicles. To the best of knowledge, this is the fi rst in vitro and in vivo study of gold nanotubes.[1]

References

[1] Ye S, et al. Adv Funct Mater. 2015 1;25(14):2117–27.

Figures

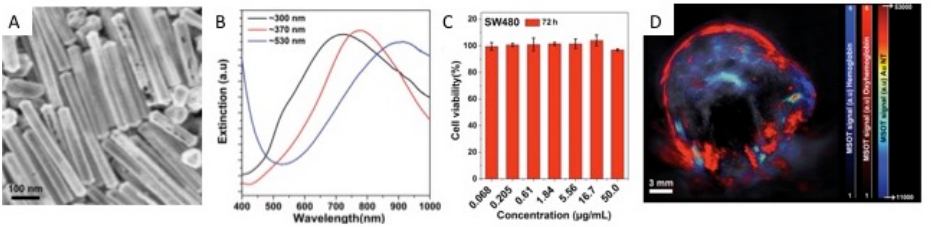

Figure 1: A. Hollow gold nanotubes of controlled length. B. NIR absorption, C) Cell viability assay and D) In-vivo imaging using Multispectral optical tomography.