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Enhanced T1 MRI contrast and fluorescence stability within a plasmonic core-shell nanoparticle

Multifunctional plasmonic nanostructures have enormous potential in the treatment of solid tumors; however, tracking particles with drug cargo and triggering the release of the cargo in mapped tumors is still impossible. To overcome this challenge, we have developed an MRI and fluorescent active nanostructure nanomatryoshka. This new nanostructure with IR plasmonic signatures is composed of a 50nm Au core surrounded by dye molecules and Gd(III)-DOTA chelate doped SiO2 inner-shell and an outer Au shell. The experimental results demonstrate an enhanced T1 relaxation (r1 ~ 24mM-1s-1 at 4.7 T) compared to the clinical Gd(III)-DOTA chelating agents (r1 ~ 4mM-1s-1). Further, this design preserves the fluorescence signal (65%) after 24 hours of exposure, leading to enhanced fluorescence photostability (23x). This dual-imaging functionality nanosystem increases MRI sensitivity by concentrating Gd(III) ions into the Gd-NMs, reduces the potential toxicity of Gd(III) ions and dye molecules by preventing their release *in vivo* through the outer Au shell protection, and the terminal gold layer surface can then be functionalized to increase cellular uptake, circulation time, or thermal drug-release properties.

Biography

Oara Neumann has completed her PhD and Post-doctoral study in Applied Physics at Rice University and MS from Weizmann Institute of Science, Israel, and Bucharest University, Romania. She is a Research Scientist in Naomi Halas group at Rice University. She holds 12 patents and has published more than 25 papers in reputed journals.

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