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

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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 50 nm Au core surrounded by dye molecules and Gd(III)-DOTA chelate doped SiO_2 inner-shell and an outer Au shell. The experimental results demonstrates an enhanced T1 relaxation (r1~24 mM^{-1} s^{-1} at 4.7 T) compared to the clinical Gd(III)-DOTA chelating agents (r1~4 mM^{-1} s^{-1}). Further, this design preserves the fluorescence signal (65%) after 24 hours of exposure, leading to enhanced fluorescence photo-stability (23x). This dual-imaging functionality nano-system 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 Postdoctoral study in Applied Physics from 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 she has published more than 25 papers in reputed journals.

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