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# MRI AND FLUORESCENT ACTIVE PLASMONIC NANOMATRYOSHKA

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**E**ngineering a compact, near-infrared plasmonic nanostructure with integrated image-enhancing agents for combined imaging and therapy is an important nanomedical challenge. To overcome this challenge we designed a nanostructure with NIR plasmonic signatures composed of a 50 nm Au core surrounded a SiO<sub>2</sub> inner-shell doped with contrast agents and an outer Au shell. The plasmon resonance of this nanostructure, known as a nanomatyoshka (NM), can be tuned to the desired wavelength by varying the thickness of the layers. The encapsulated contrast agents used in this study are: Fe (III)-DOTA, Gd(III)-DOTA, and fluorescent dyes. The Fe (III)-NM based contrast agents are found to have relaxivities two times greater than the widely used Gd(III)-DOTA, providing a practical alternative for T1 MRI contrast agent that eliminates Gd(III) patient exposure entirely. Additionally, the internalization of fluorescent dyes and MRI contrast imaging agents within the NM substantially reduces the toxicity while maintaining a free nanoparticles surface for further bio-functionalization.

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