ULTRASMALL HEXAGONAL $NaGdF_4$:Yb NANOPARTICLES: A THERANOSTIC APPROACH TO RADIOTHERAPY

Jossana Damasco, Department of Chemistry and Institute for Lasers, Photonics, and Biophotonics, State University of New York at Buffalo, New York, USA
jossanad@buffalo.edu
Guanying Chen, Department of Chemistry and Institute for Lasers, Photonics, and Biophotonics, State University of New York at Buffalo, New York, USA
Tymish Ohulchanskyy, Department of Chemistry and Institute for Lasers, Photonics, and Biophotonics, State University of New York at Buffalo, New York, USA
Haoyuan Huang, Department of Biomedical Engineering, State University of New York at Buffalo, New York, USA
Supriya Mahajan, Department of Medicine, Division of Allergy, Immunology and Rheumatology, State University of New York at Buffalo, New York, USA
Timothy Winslow, Roswell Park Cancer Institute, Buffalo, NY, USA
Jonathan Lovell, Department of Biomedical Engineering, State University of New York at Buffalo, New York, USA
Paras Prasad, Department of Chemistry and Institute for Lasers, Photonics, and Biophotonics, State University of New York at Buffalo, New York, USA

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Uniform sub 5-nm β-$NaGdF_4$:Yb nanoparticles as bimodal contrast agent for T_1 MRI and CT have exhibited dual imaging capability comparable to the commercially available contrast agents for both MRI (i.e. Gd-DTPA) and CT (i.e. Iohexol) modalities. In addition, these nanoparticles can act as radiosensitizer resulting in a significant cell reproductive death after irradiation. In the absence of irradiation treatment, no adverse effects were observed in the cells incubated with the nanoparticles, as further confirmed by MTS assay. These indicate good potential as theranostic agent to facilitate targeted radiation therapy for optimal eradication of tumor cells with minimal damage to the surrounding normal cells. Looking at the biodistribution of these nanoparticles based on *ex vivo* analysis of Gd^{3+} ions via ICP-MS implies body clearance through urine and feces within a reasonable timescale. Given all these properties, these ultrasmall $NaGdF_4$:Yb nanoparticles can serve as a good candidate for the development and design of image-guided radiotherapy.