ULTRASMALL HEXAGONAL NaGdF₄:Yb NANOPARTICLES: A THERANOSTIC APPROACH TO RADIOTHERAPY

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Key Words: gadolinium nanoparticles, radiosensitizer, theranostics

Uniform sub 5-nm β-NaGdF₄:Yb nanoparticles as bimodal contrast agent for T₁ 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 Gd³⁺ ions via ICP-MS implies body clearance through urine and feces within a reasonable timescale. Given all these properties, these ultrasmall NaGdF₄:Yb nanoparticles can serve as a good candidate for the development and design of image-guided radiotherapy.