

Labeling Cells with Fluorinated Silicon Nanoparticles for Targeted ^{19}F -MRI and Fluorescence Imaging

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As a noninvasive molecular imaging modality, optical imaging provides high sensitivity and specificity but poor tissue penetration depth. On the contrary, MRI has high spatial resolution in deep tissue, but it suffers the drawbacks of low sensitivity. The combination of MRI and optical imaging, which takes advantages of both modalities, has received widespread attention in biological and medical application. Compared to conventional ^1H -MRI, ^{19}F -MRI displays an intense sensitivity (0.83 relative to ^1H) and negligible background signal. Herein, we report a one-pot microwave synthesis of a functionalized ^{19}F CA, fluorinated silicon nanoparticles (^{19}F -SiNP), for targeted detection of A549 lung cancer cells. Moreover, based on the quantum effects of the nano-sized nanoparticles, the ^{19}F SiNP can also act as a label free dye for ultracontrast fluorescent imaging. *In vitro* and *in vivo* results shows that the peptide-conjugated ^{19}F SiNP can specifically detect A549 cells for dual ^{19}F -MRI and fluorescence imaging. Such functionalized ^{19}F SiNP can also be labeled to other cancer cells by replacing the targeting group, providing a handy and reliable way for targeted dual-model imaging.

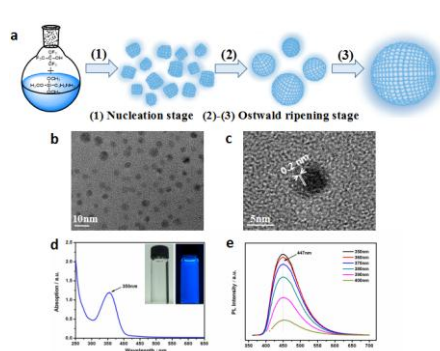


Fig 1. (a) Schematic illustration of microwave synthesis of ^{19}F -SiNPs. (b) TEM and (c) HRTEM images of the resultant ^{19}F -SiNPs. (d) UV and (e) PL spectral of the ^{19}F -SiNPs.

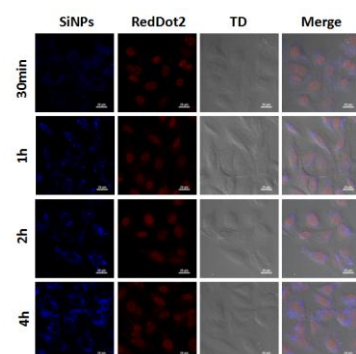


Fig 2. CLSM images of A549 cells incubated with ^{19}F -SiNPs for specific times, cell nuclei stained with RedDot2(red).

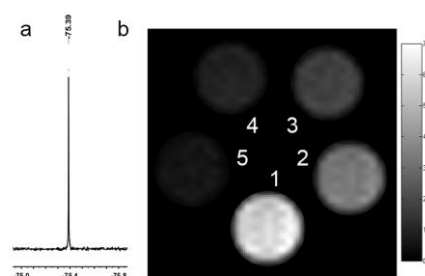


Fig 3. (a) ^{19}F NMR spectrum of ^{19}F -SiNPs aqueous solution (10mg/mL). (b) ^{19}F MRI of ^{19}F -SiNPs aqueous solution with various concentration. (1-5): 64, 32, 16, 8, 4mg/mL.

Biography

Dr. Yuqi Yang received her PhD in 2015 from Central China Normal University, and then joined Wuhan Institute of Physics and Mathematics as an assistant professor. Dr. Yang's study focuses on multi-modality contrast agents, especially specializes in nanomaterial-based agents for molecular imaging of targeted cancer cells.