DNAzymes-Embedded Framework Nucleic Acids (FNAzymes) for Metal Ions Imaging in Living Cells

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Table S1. The DNA sequences in the experiment.

DNA name	Sequence (5'-3')
S1	ROX-ACTCACTAT(rA)GGAAGAGATGATTTATCACCCGCC ATAAGTAGTCGTATCACCAGGCAGTTGAC-BHQ-2
S2	CATCTCTTCTCCGAGCCGGTCGAAATAGTGAGTT(BHQ-2) CATGCGAGGGTCTAATCATGTCGATTACAGCTTGCTACA CG
S3	CTACTATGGCGGGTGATAAAACGTGTAGCAAGCTGTAAT CGT(Dabcyl)GGTAAGCCTGGGCCTCTTTCTTTTTAAGAAA GAAC
S4	Dabcyl-CATGATTAGACCCTCGCATGTGTCAACTGCCTGGT GATACGTAGCTTCTTTCTAATACGGCTTACC-FAM
Enzyme-1	GGTAAGCCTGGGCCTCTTTCTTTTTAAGAAAGAAC
Substrate-1	AGCTTCTTTCTAATACGGCTTACC
S1-2	ACTCACTAT(rA)GGAAGAGATGATTTATCACCCGCCATA AGTAGTCGTATCACCAGGCAGTTGAC-BHQ-2
S4-2	Dabcyl-CATGATTAGACCCTCGCATGTGTCAACTGCCTGGT GATACGTAGCTTCTTTCTAATACGGCTTACC
F1	CTTACC-FAM
F2	ROX-ACTCACTAT

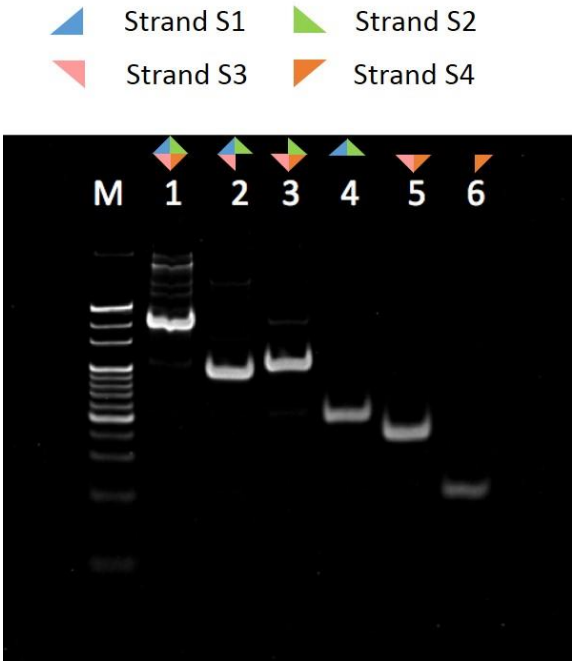

Figure S1. Native PAGE (8%) analysis of the self-assembled products for all possible combinations from the four DNA strands (Strand S1, Strand S2, Strand S3 and Strand S4). The concentrations of the strands were all 1 μM, and the mixtures were heated at 95 °C for 10 minutes and quickly cooled down to 4 °C.

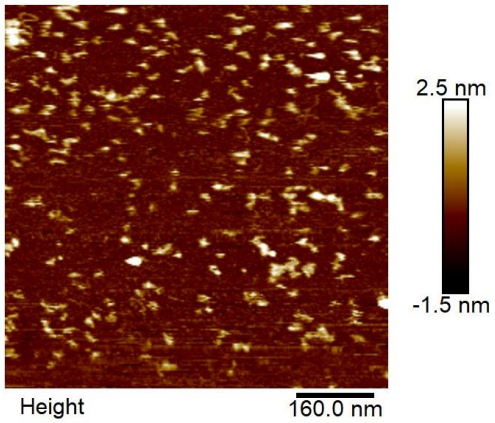

Figure S2. Atomic force microscope (AFM) image of the FNAzymes.

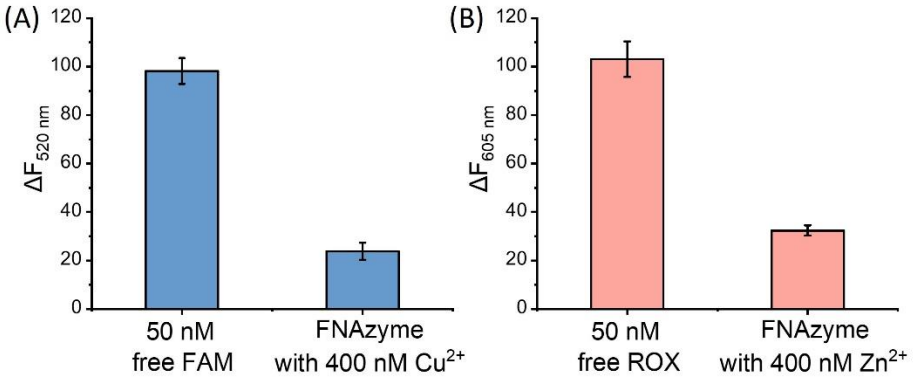

Figure S3. (A) Fluorescence change ($\Delta F_{520\ nm}$) of FNAzymes-1 incubated with 50 nM of free FAM-labeled DNA (F1) and FNAzyme incubated with 400 nM Cu^{2+}. (B) Fluorescence change ($\Delta F_{605\ nm}$) of FNAzymes-2 incubated with 50 nM of free ROX-labeled DNA (F2) and FNAzyme incubated with 400 nM Zn^{2+}. The ΔF was calculated as the fluorescence in the samples (signal) minus the fluorescence prior to cleavage (background).

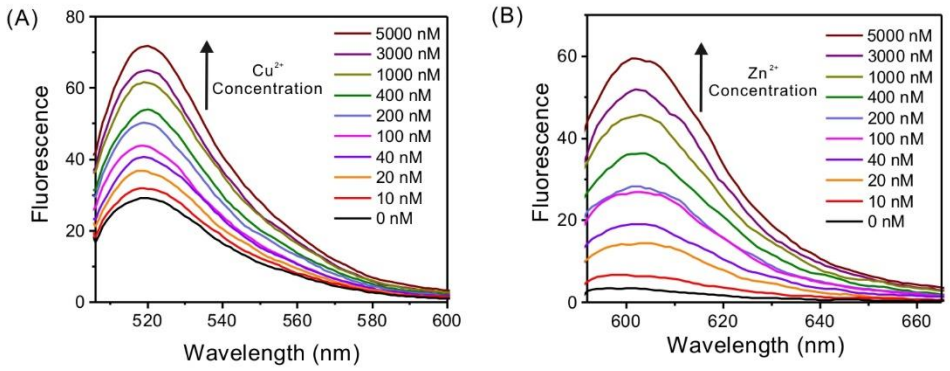

Figure S4. Fluorescence spectra of the FNAzymes with various concentrations (0, 10, 20, 40, 100, 200, 400, 1000, 3000 and 5000 nM) of (A) Cu^{2+} and (B) Zn^{2+}. Cu^{2+} (FAM), λ_{ex}: 494 nm; Zn^{2+} (ROX), λ_{ex}: 580 nm.

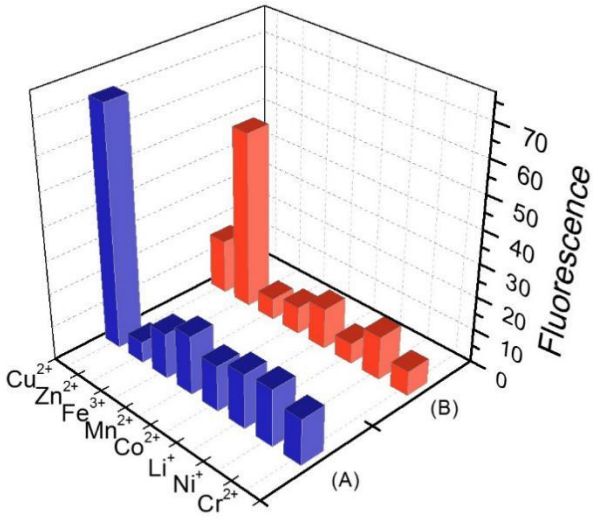

Figure S5. Selectivity evaluation of the FNAzymes for the target Cu^{2+}, Zn^{2+} against several other metal ions (Fe^{3+}, Mn^{2+}, Co^{2+}, Li^{+}, Ni^{+}, and Cr^{2+}) measured with (A) $\lambda_{ex}/\lambda_{em}$: 494 nm/520 nm (FAM) and (B) $\lambda_{ex}/\lambda_{em}$: 580 nm/605 nm (ROX). The concentration of all the metal ions were 1 μM, respectively.

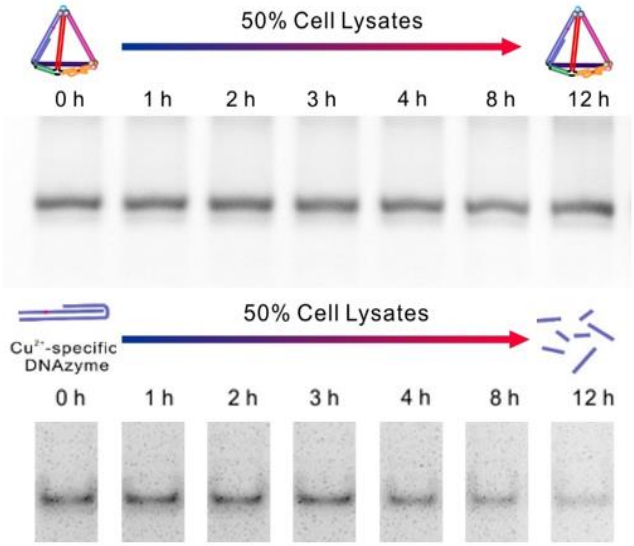

Figure S6. Electrophoresis characterization of the FNAzymes and the nude Cu^{2+}-dependent DNAzyme incubated in 50% cell lysate at 37 °C for different time. The concentrations of probes are all 1 μM.