

**Table S3.** Statistics of relative bioluminescence intensity of enzyme system in 1,4-benzoquinone solution (Figure 9)

Samples	p	
	Concentrations	
Fe <sub>3</sub> O <sub>4</sub>	0.0001	
Fe <sub>3</sub> O <sub>4</sub> /APTES	0.0001	
Fe <sub>3</sub> O <sub>4</sub> /HA	0.001	
	Comparison by sample pairs	
	Concentration≤5E-06	Concentration>5E-06
Fe <sub>3</sub> O <sub>4</sub> /APTES- Fe <sub>3</sub> O <sub>4</sub>	0.01	>0.05
Fe <sub>3</sub> O <sub>4</sub> /HA- Fe <sub>3</sub> O <sub>4</sub>	>0.05	0.001
Fe <sub>3</sub> O <sub>4</sub> /HA- Fe <sub>3</sub> O <sub>4</sub> /APTES	0.01	0.001

Bioactivity in relation to control:													
Samples	Concentraions, mg/L												
Fe <sub>3</sub> O <sub>4</sub> - control	4.7E-12	4.7E-11	4.7E-10	4.7E-9	4.7E-8	4.7E-7	4.7E-6	4.7E-5	4.7E-4	4.7E-3	4.7E-2	4.7E-1	4.7E+0
	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	0.0001	0.0001
	0.05												
Fe <sub>3</sub> O <sub>4</sub> / APTES- control	1.1E-12	1.1E-11	1.1E-10	1.1E-9	1.1E-8	1.1E-7	1.1E-6	1.1E-5	1.1E-4	1.1E-3	1.1E-2	1.1E-1	1.1E+0
	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	0.01	0.01	>0.05	0.0001
	0.05												
Fe <sub>3</sub> O <sub>4</sub> / HA- control	4.9E-13	4.9E-12	4.9E-11	4.9E-10	4.9E-9	4.9E-8	4.9E-7	4.9E-6	4.9E-5	4.9E-3	4.9E-2	4.9E-1	4.9E+0
	>0.05	>0.05	>0.05	>0.05	0.01	>0.05	>0.05	0.01	0.01	0.001	0.0001	0.0001	0.0001
	0.01												