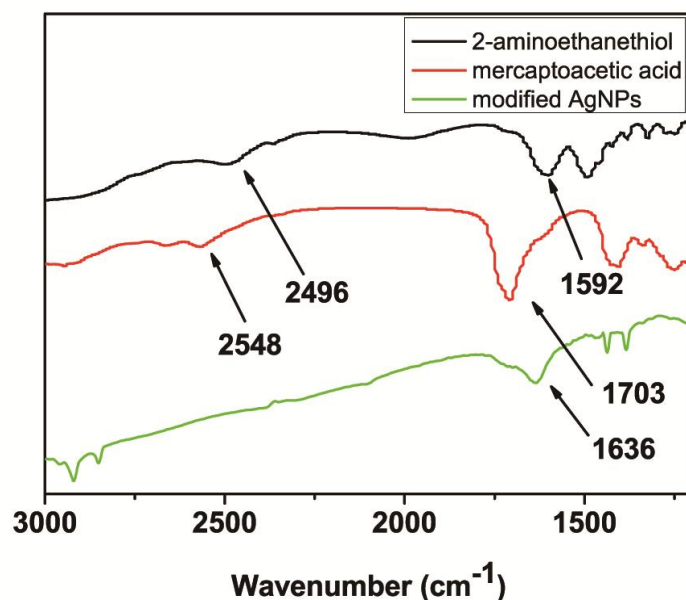
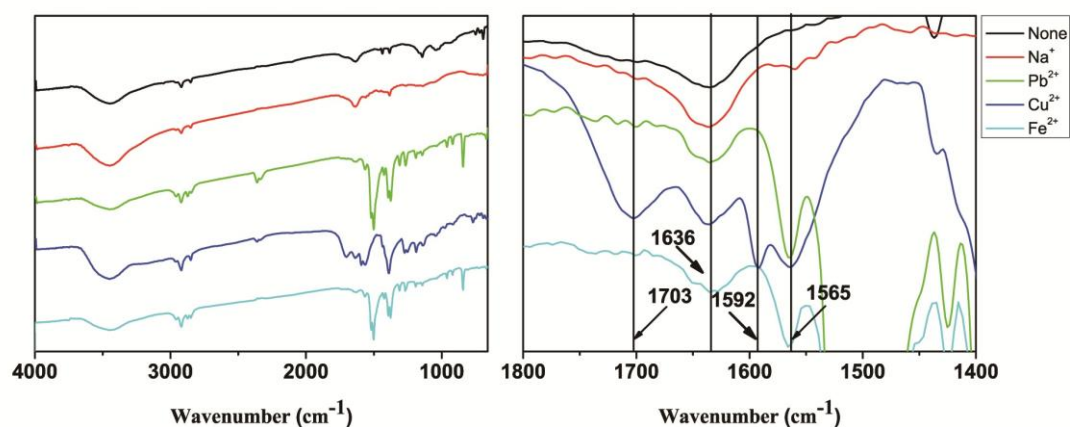


## Multifunctional Modified Silver Nanoparticles as Ion and pH Sensors in Aqueous Solution

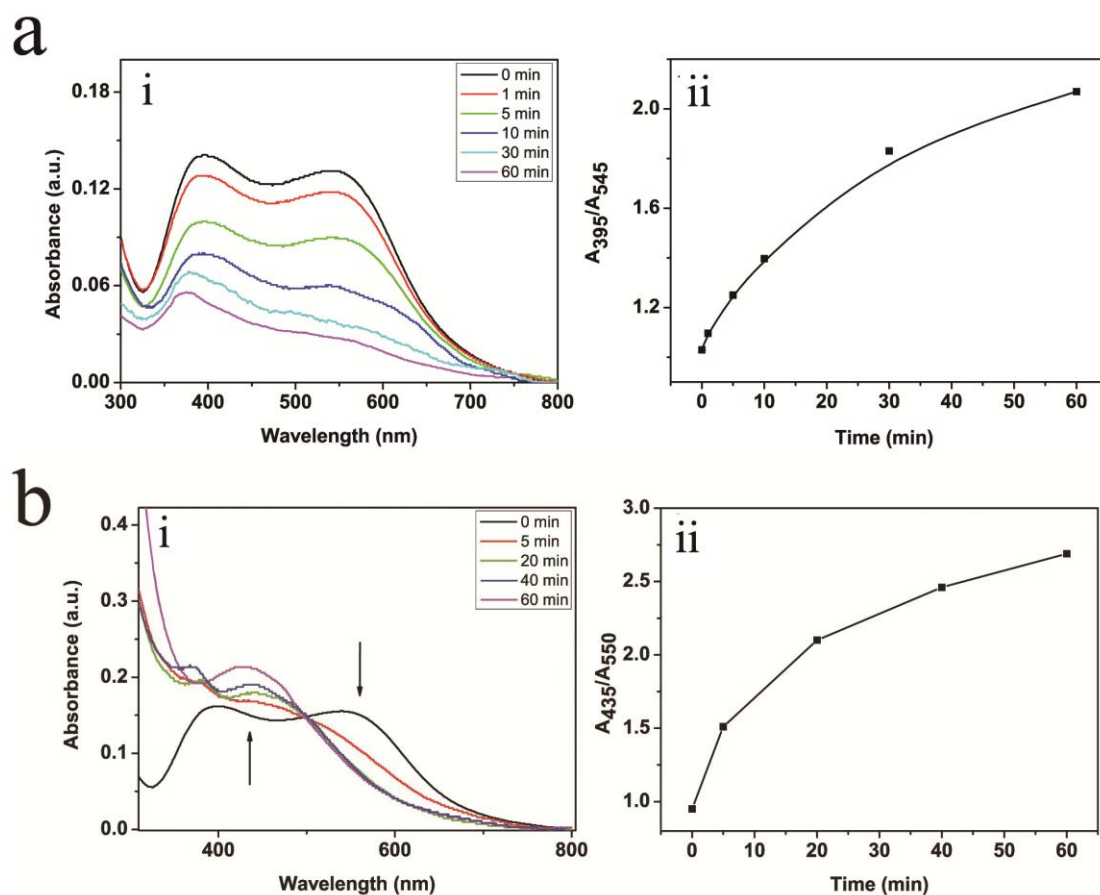
Xin Chen<sup>a</sup>, Xiaoyu Cheng<sup>a</sup> and J. Justin Gooding<sup>a\*</sup>



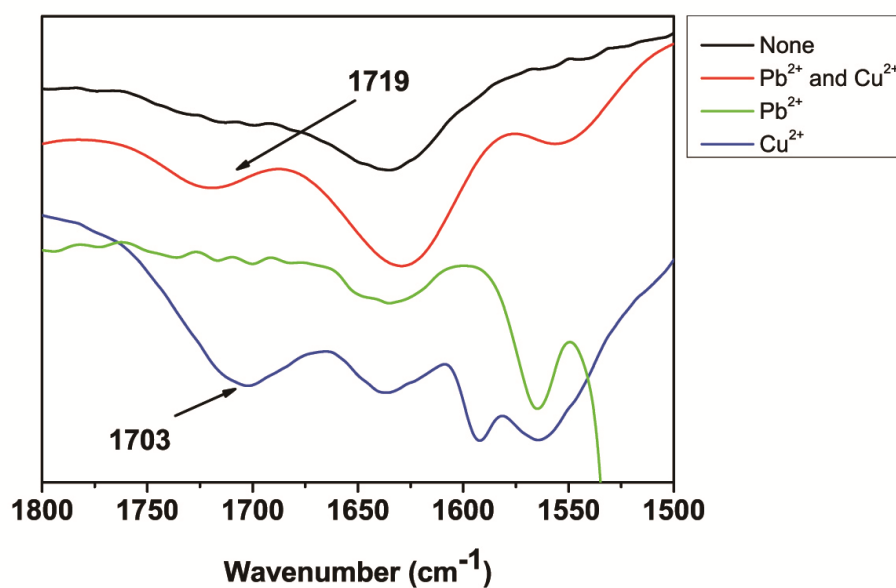
**Figure S1.** FT-IR spectra of mercaptoacetic acid, 2-aminoethanethiol and these two short-chain thiol molecules functionalized silver nanoparticles



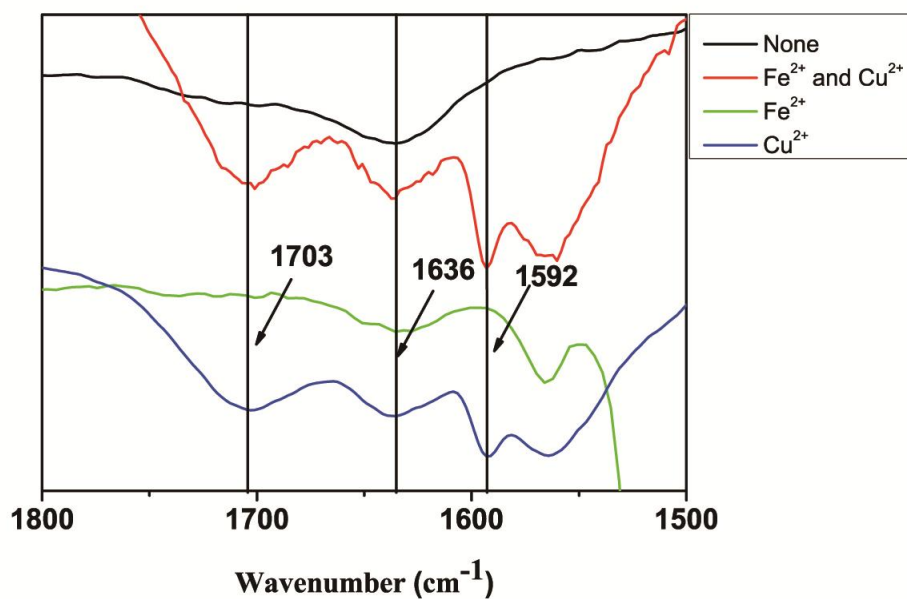
**Figure S2.** FT-IR spectra of the mercaptoacetic acid and 2-aminoethanethiol functionalized silver nanoparticles with and without various ions. Except  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$  and  $\text{Fe}^{2+}$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Cr}^{2+}$  or  $\text{Cd}^{2+}$  ions showed no change as  $\text{Na}^+$  in the spectra.



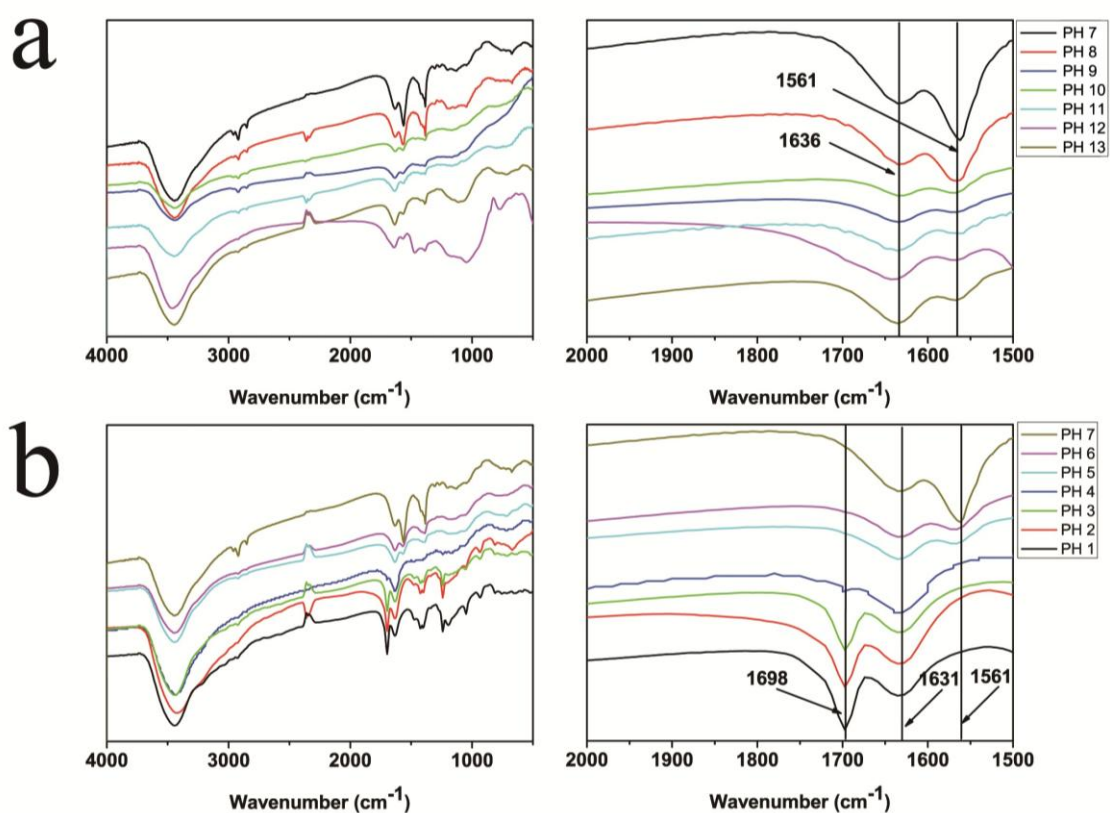
**Figure. S3** UV/Vis spectra (i) and the plot of absorbance against incubation time (ii) of the functionalized silver nanoparticles system in the presence of (a)  $\text{Pb}^{2+}$ , (b)  $\text{Fe}^{2+}$  ions.



**Figure S4.** FT-IR spectra of the mercaptoacetic acid and 2-aminoethanethiol functionalized silver nanoparticles in present of  $\text{Pb}^{2+}$  (green line),  $\text{Cu}^{2+}$  (blue line),  $\text{Pb}^{2+}$  and  $\text{Cu}^{2+}$  (red line) and no ions (black line).



**Figure S5.** FT-IR spectra of the mercaptoacetic acid and 2-aminoethanethiol functionalized silver nanoparticles in present of  $\text{Fe}^{2+}$  (green line),  $\text{Cu}^{2+}$  (blue line),  $\text{Fe}^{2+}$  and  $\text{Cu}^{2+}$  (red line) and no ions (black line).



**Figure S6.** FT-IR spectra of the mercaptoacetic acid and 2-aminoethanethiol functionalized silver nanoparticles at alkaline (a) and acidic (b) solution.