

## **Supporting Information**

### **Synthesis and Photo-darkening/Photo-brightening of Blue Emitting Doped Semiconductor Nanocrystals**

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## Experimental Section:

### Materials

Zinc stearate ( $\text{ZnSt}_2$ , tech), octadecylamine (ODA, 97%), octadecene (ODE, tech.), stearic acid (SA, 95%), 1-dodecanethiol (98%), tetramethylammonium hydroxide (TMAH, 25% in methanol), trioctylphosphine, oleic acid (OA, 90%), copper (II) chloride (97%), S powder, aluminum acetate (basic) are purchased from Aldrich. Silver acetate ( $\text{Ag}(\text{OAc})$ ) is purchased from Avra Synthesis. All the chemicals have been used without further purification.

### Synthesis of Copper Stearate ( $\text{CuSt}_2$ )

In a typical process, 10 mmol SA has been dissolved in 20 ml of methanol in a conical flask and heated to 50 °C to get a clear solution. 10 mmol TMAH has been dissolved in methanol separately and added to the SA solution dropwise. The mixture has been stirred for 20 min to complete the reaction. 5 mmol of  $\text{CuCl}_2$  is dissolved in methanol and dropwise added to the above solution under vigorous stirring condition. Sky blue precipitate of copper(II) stearate has been washed thoroughly with hot ethanol and collected and lastly, dried under vacuum.

### Preparation of Stock Solutions

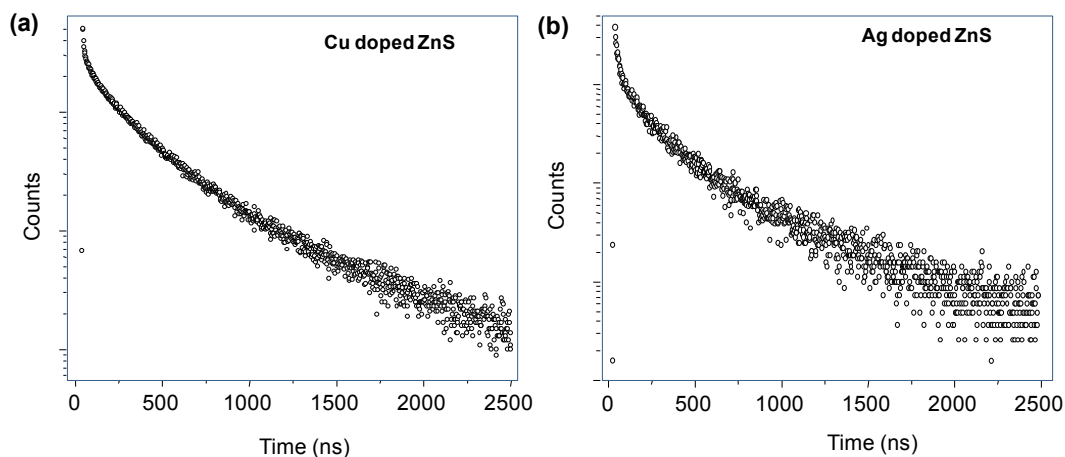
**Cu Stock Solution:** Stock solution of  $\text{CuSt}_2$  has been prepared by dissolving 0.1 mmol of  $\text{CuSt}_2$  in 10 ml of octadecene under inert atmosphere. The solution needs gentle heating to obtain clear solution. This has been stored in a sealed vial.

**Ag Stock Solution:** stock solution of  $\text{Ag}(\text{OAc})$  has been prepared by dissolving 0.1 mmol of  $\text{Ag}(\text{OAc})$  in 10 mmol of oleic acid in inert atmosphere through gentle heating at ~80 °C and the total volume of the stock solution has been maintained to 10 ml by addition of 1-octadecene.

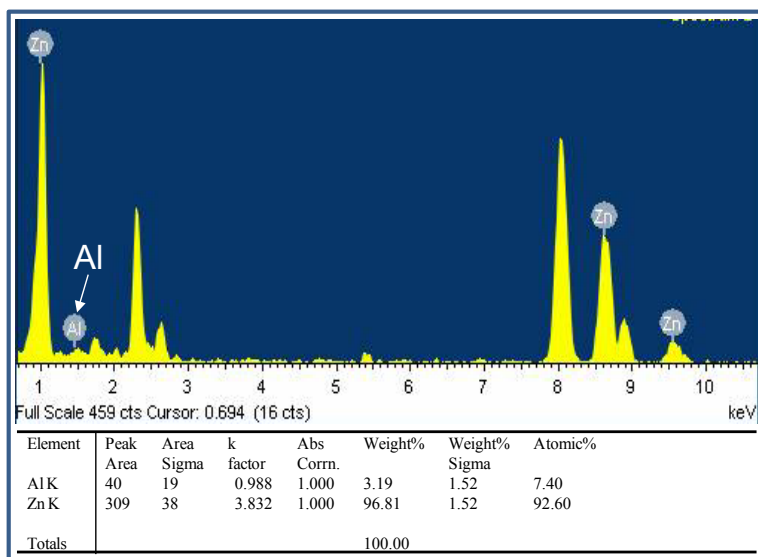
**Al-oleate Stock:** This stock solution has been prepared by dissolving 1 mmol of basic aluminum acetate in 10 mmol of oleic acid through gentle heating at  $\sim 80$  °C and then 1-octadecene has been introduced to make the total volume 10 ml.

**ZnSt<sub>2</sub> and Stearic acid solution stock:** This stock solution has been prepared by dissolving 1 mmol ZnSt<sub>2</sub> and 0.5 mmol stearic acid in 4 ml of 1-octadecene under inert atmosphere. The mixture needs heating  $\sim 100$  °C to make the solution clear.

## Supporting results and Figures



**Fig. S1** (a) and (b) Present the excited state lifetime of thiol capped Cu:ZnS and Ag:ZnS respectively. The excited state lifetime has been found to be 230 ns and 171 ns for Cu:ZnS and Ag:ZnS respectively.



**Fig. S2** Presents the EDX analysis data for Al,Cu:ZnS, showing the presence of Al in the ZnS lattice

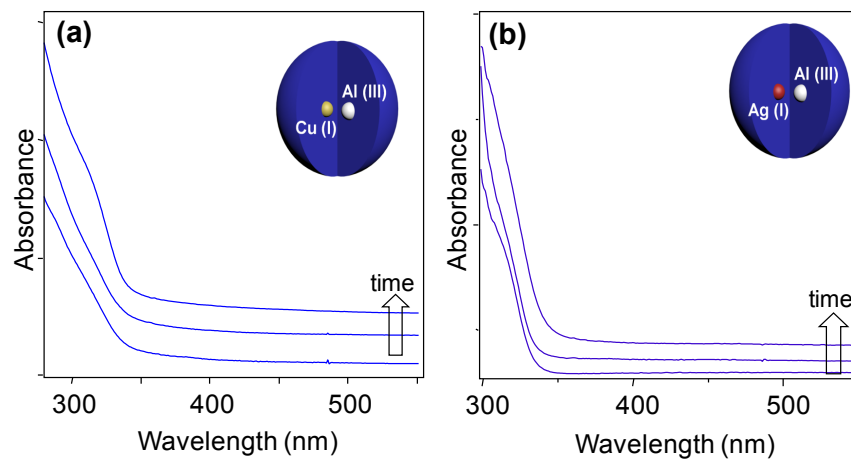
**Table S1.** ICP-AES values for the Cu(%) and Al(%) at the different stages of a reaction.

For Cu doped Al co-doped ZnS		
Element	(% of different elements at different time of a typical reaction	
	30 min	120 min
Cu	0.59%	0.36%
Al	1.42%	1.06%

**Table S2.** ICP-AES values for the Ag(%) and Al(%) at the different stages of a reaction.

For Ag doped Al co-doped ZnS		
Element	(% of different elements at different time of a typical reaction	
	30 min	120 min
Ag	0.48%	0.41%
Al	1.54%	0.84%

**Note:** In both tables, the dopant percentage has been provided taking the average of five measurements.



**Fig. S3** (a) and (b) present the UV-vis of the Al,Cu:ZnS and Al,Ag:ZnS for photoluminescence spectra presented in Figure 2 respectively.