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# Fluorescent and water-dispersible ternary alloyed Cu- and Al-co-doped ZnSeS/ZnS QDs

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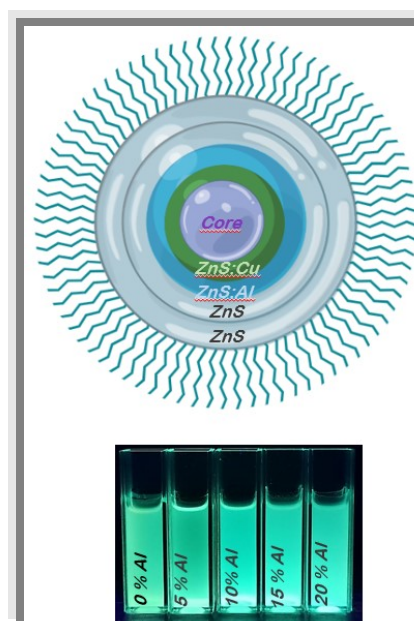
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## Abstract:

Fluorescent and water-dispersible ternary alloyed Cu- and Al-co-doped ZnSeS/ZnS QDs with pure dopant emission have been synthesized through a simple aqueous synthetic route using 3-mercaptopropionic acid (3-MPA) as capping ligand (Figure 1). The influence of the Cu and Al-dopant concentrations has been systematically investigated in order to optimize the Cu-related photoluminescence (PL) emission. Through the increase of the dopants concentration, a significant increase of the PL quantum yield of Cu,Al:ZnSeS/ZnS QDs was observed (up to 30%). PL excitation and time-resolved PL measurements were also conducted to study the PL mechanism.

The crystal structure and shape of Cu,Al:ZnSeS/ZnS core/shell QDs were investigated using XRD, TEM and HR-TEM. XRD reveals that QDs exhibit the zinc blende crystal structure. With the increase of the Al dopant concentration, a slight shift of the XRD peaks to small diffraction angle corresponding to the incorporation of Al<sup>3+</sup> ions in the ZnSeS host was observed. TEM and HR-TEM results show that the nanocrystals have a spherical shape and a size around 2.8 nm. The composition of the QDs was also confirmed by XPS measurements. In addition, Cu,Al:ZnSeS/ZnS QDs exhibit a high photostability.

**Keywords:** Quantum Dots, , Core/Shell, Photoluminescence, Co-Doping, Stability.



**Figure 1:** Schematic illustration of the structure of Cu,Al:ZnSeS/ZnS QDs and digital photograph taken under UV light illumination of the dots when varying the Al<sup>3+</sup> dopant percentage.

## References:

1. Jason K. Cooper, Sheraz Gul. (2015) Tunable Photoluminescent Core/Shell Cu<sup>+</sup>-Doped ZnSe/ZnS Quantum Dots Codoped with Al<sup>3+</sup>, Ga<sup>3+</sup>, or In<sup>3+</sup>. American Chemical Society.