Title: Tunable emission properties of core-shell ZnCuInS-ZnS quantum dots with enhanced fluorescence intensity

Authors: Yihe Jia, Haicheng Wang, Long Xiang, Xiaoguang Liu, Wei Wei, Ning Ma, Dongbai Sun

PII: S1005-0302(17)30191-3
DOI: http://dx.doi.org/doi:10.1016/j.jmst.2017.07.014
Reference: JMST 1031

To appear in:

Received date: 15-5-2017
Revised date: 12-6-2017
Accepted date: 30-6-2017

Please cite this article as: Yihe Jia, Haicheng Wang, Long Xiang, Xiaoguang Liu, Wei Wei, Ning Ma, Dongbai Sun, Tunable emission properties of core-shell ZnCuInS-ZnS quantum dots with enhanced fluorescence intensity (2010), http://dx.doi.org/10.1016/j.jmst.2017.07.014

Tunable emission properties of core-shell ZnCuInS-ZnS quantum dots with enhanced fluorescence intensity

Yihe Jia [1,§], Haicheng Wang [1,§,*], Long Xiang [1], Xiaoguang Liu [2], Wei Wei [1], Ning Ma [3], Dongbai Sun [1]

[1] *National Center for Materials Service Safety, University of Science and Technology Beijing, Beijing 100083, China*

[2] *Department of Inorganic Nonmetallic Materials, School of Materials Science and Engineering, University of Science and Technology Beijing 100083, Beijing, China*

[3] *College of Materials Science and Chemical Engineering, Harbin Engineering University, Harbin 150001, China*

* Corresponding author. Asso. Prof., Ph.D.; Tel.: +86 10 62332239.

E-mail address: hcwang@mater.ustb.edu.cn (Haicheng Wang).

§ Yihe Jia and Haicheng Wang contributed to this work equally.

[Received 15 May 2017; Received in revised form 12 June 2017; Accepted 30 June 2017]

Cadmium-free I-III-VI quantum dots (QDs), represented by Cu-In-S (CIS), are widely investigated for their non-toxicity and tunable emission properties. In this work, Zn-Cu-In-S (ZCIS) alloyed QDs were synthesized via a solvothermal approach by heating up a mixture of the corresponding metal precursors and sulphur powder with dodecanethiol in oleylamine media, and the fluorescent intensity was greatly enhanced by coating ZnS (ZS) shell. By changing the ratio of Cu, the as prepared ZCIS-ZS QDs showed composition-tunable photoluminescent (PL) emission over the visible spectral window from about 500 nm to 620 nm, which is much wider than that of CIS QDs. Moreover, the influence of excitation wavelength, reaction temperature and time on the optical properties of the ZCIS-ZS QDs was also studied. This research provides a feasible and simple approach to prepare ZCIS-ZS QDs with large tunable spectral range on visible region, which could greatly contribute to the development of potential applications due to their non-toxicity and excellent optical properties.