

## Supplementary Material

### Near-Infrared-Emitting CIZSe/CIZS/ZnS Colloidal Heteronanonail Structures

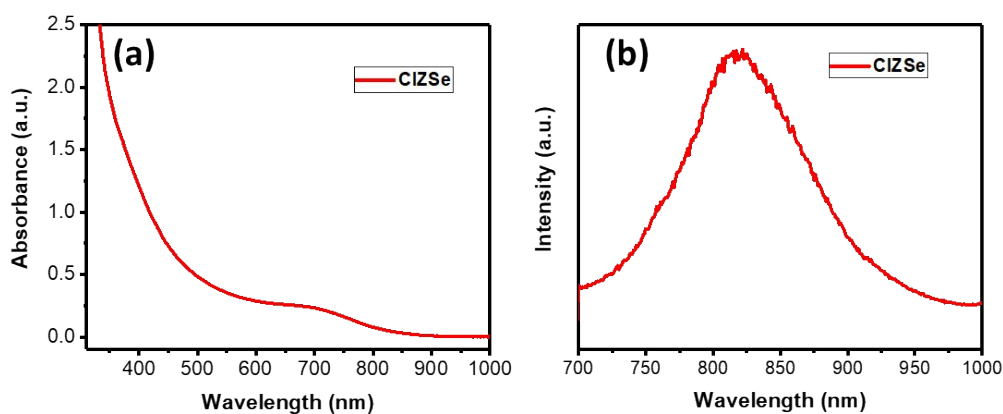
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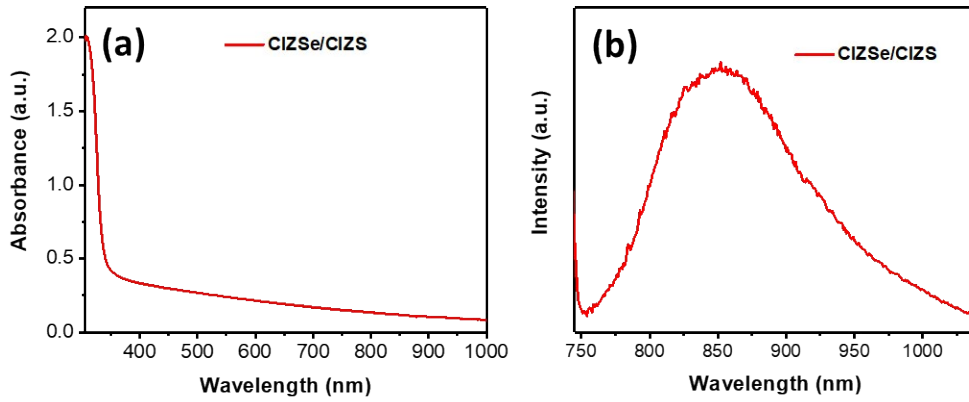
<sup>b</sup> BEACON, Bioeconomy SFI Research Centre, University College Dublin, Dublin 4, Ireland

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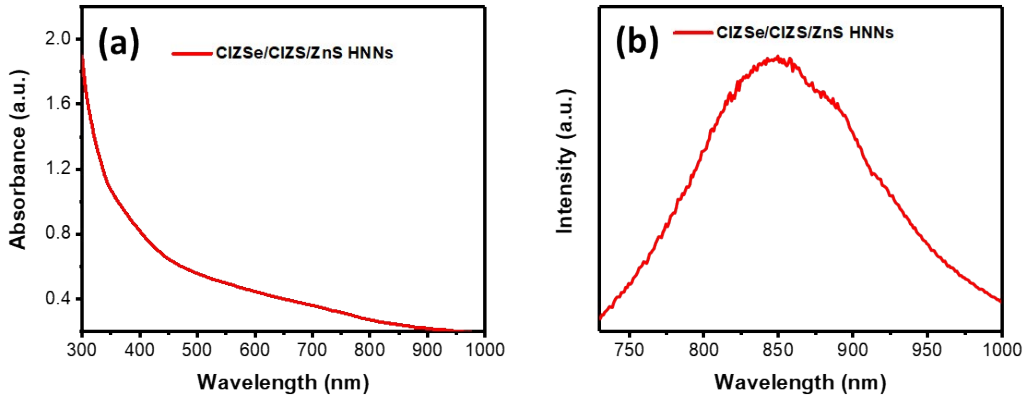
Corresponding Author: \*E-mail: igounko@tcd.ie



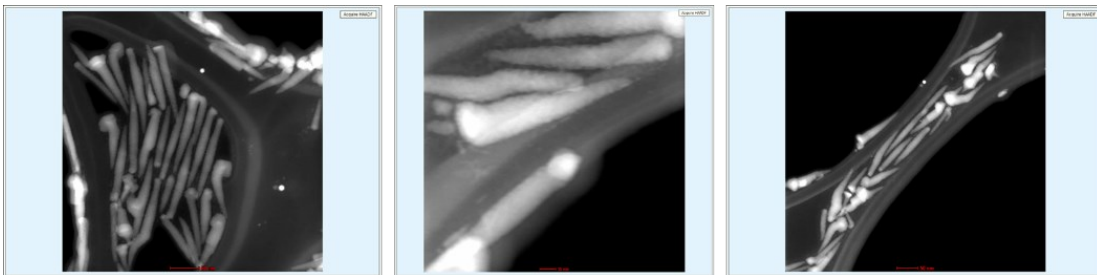
**Fig S1.** (a) The UV-Vis spectrum, (b) PL spectrum of colloidal CIZSe QDs.



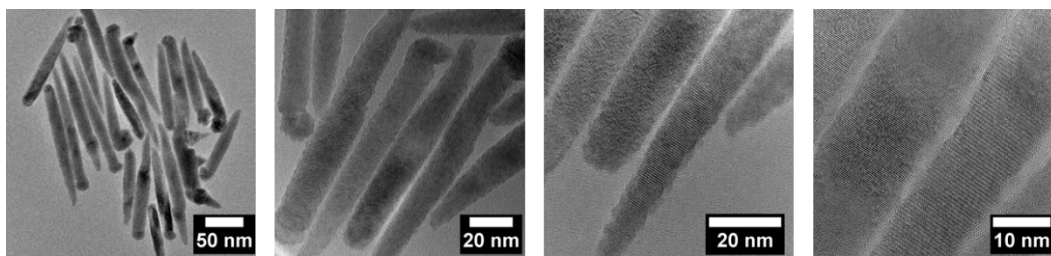
**Fig S2.** (a) UV-Vis and (b) PL spectra of CIZSe/CIZS QDs.



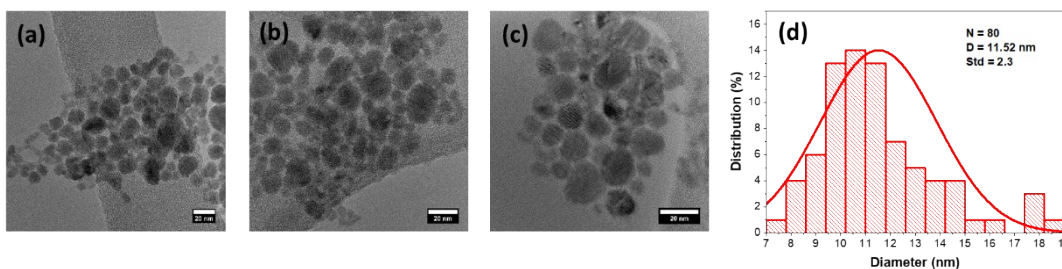
**Fig S3.** (a) UV-Vis and (b) PL spectra of CIZSe/CIZS/ZnS HNNs.



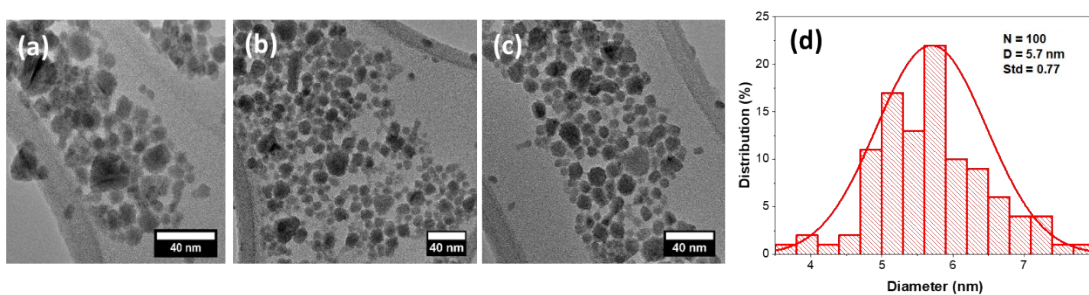
**Fig S4.** STEM images of CIZSe/CIZS/ZnS HNNs (Cu:In:Zn = 1:2:3).



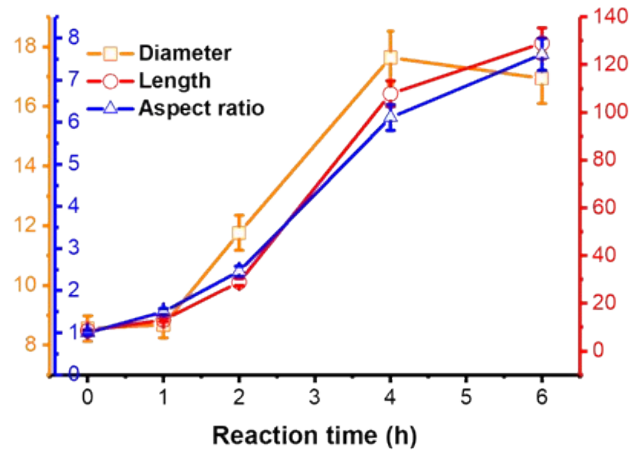
**Fig S5.** TEM images of CIZSe/CIZS/ZnS HNNs (Cu:In:Zn = 1:2:3).



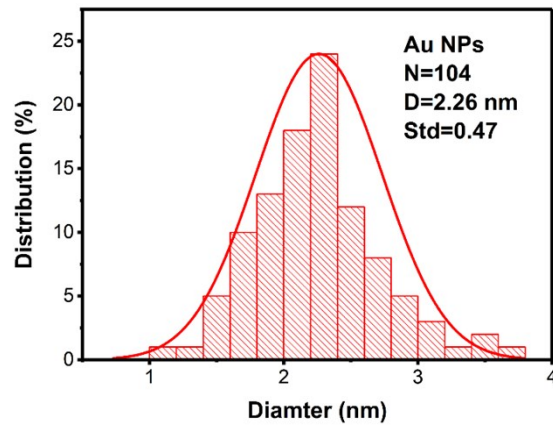
**Fig S6.** (a-c) TEM images of CIZSe/CIZS QDs (Cu:In:Zn = 1:3:2). (d) Diameter histogram of the sample.



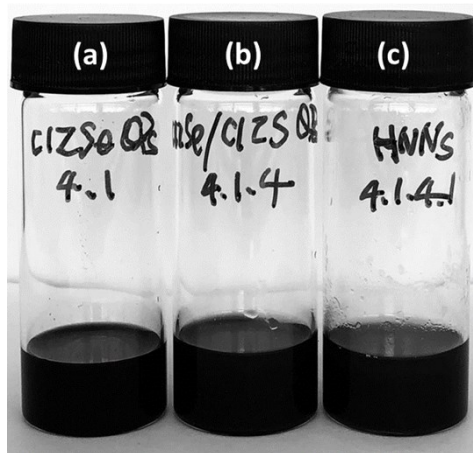
**Fig S7.** (a-c) TEM images of CIZSe/CIZS QDs (Cu:In:Zn = 1:1:3). (d) Diameter histogram of the sample.



**Fig S8.** The change of diameter, length and aspect ratio of the HNN structure during reaction.



**Fig S9.** Diameter histogram of the Au particles that deposited on the HNN surface.



**Figure S10.** Pictures of (a) CIZSe QDs, (b) CIZSe/CIZS QDs and (c) CIZSe/CIZS/ZnS HNNs after being stored in the fridge for three months.