Electronic Supplementary Information (ESI)

Doped semiconductor nanocrystal based fluorescent cellular imaging probes

Amit Ranjan Maity, Sharbari Palmal, SK Basiruddin, Niladri Sekhar Karan, Suresh Sarkar, Narayan Pradhan and Nikhil R. Jana*

Centre for Advanced Materials and Department of Materials Science, Indian Association for the Cultivation of Science, Kolkata-700032, India

*Corresponding author. E-mail: *camnrj@iacs.res.in*. Telephone: +91-33-24734971. Fax: +91-33-24732805

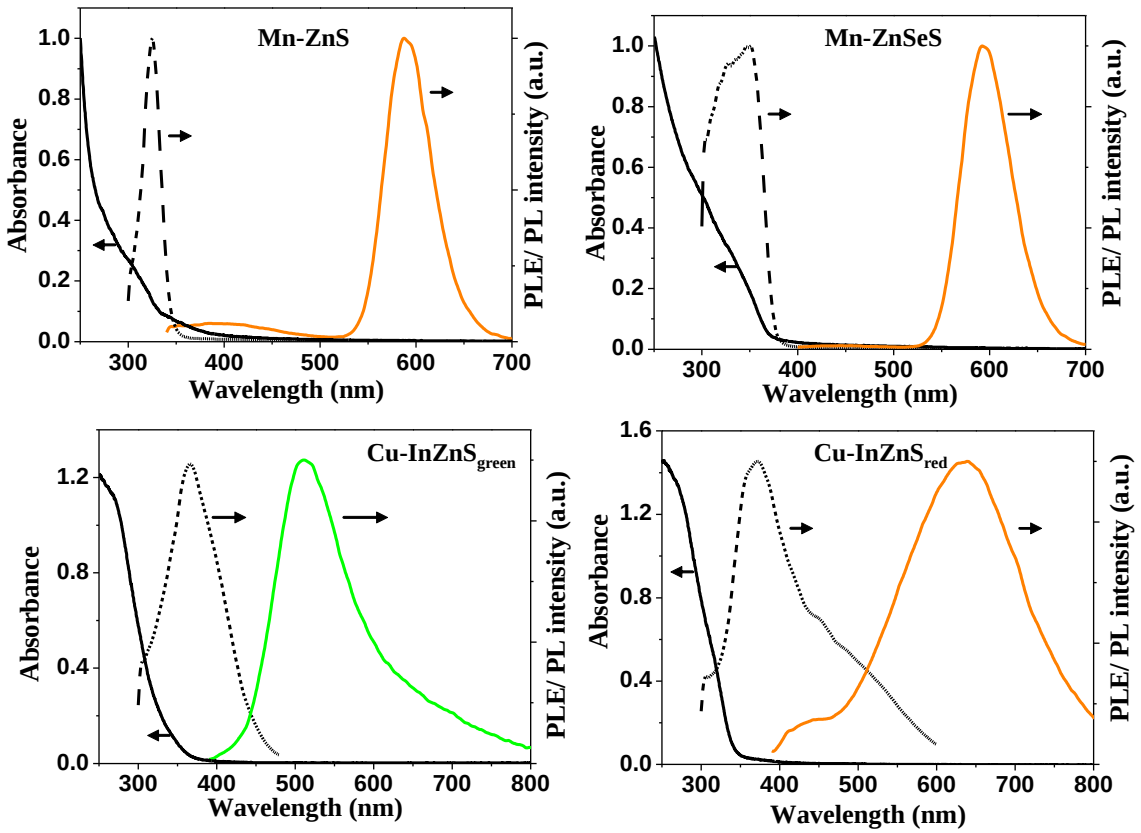

Figure S1. The absorption (black line), excitation (dotted line) and emission (colour line) spectra of different hydrophobic doped nanocrystals in chloroform solution.

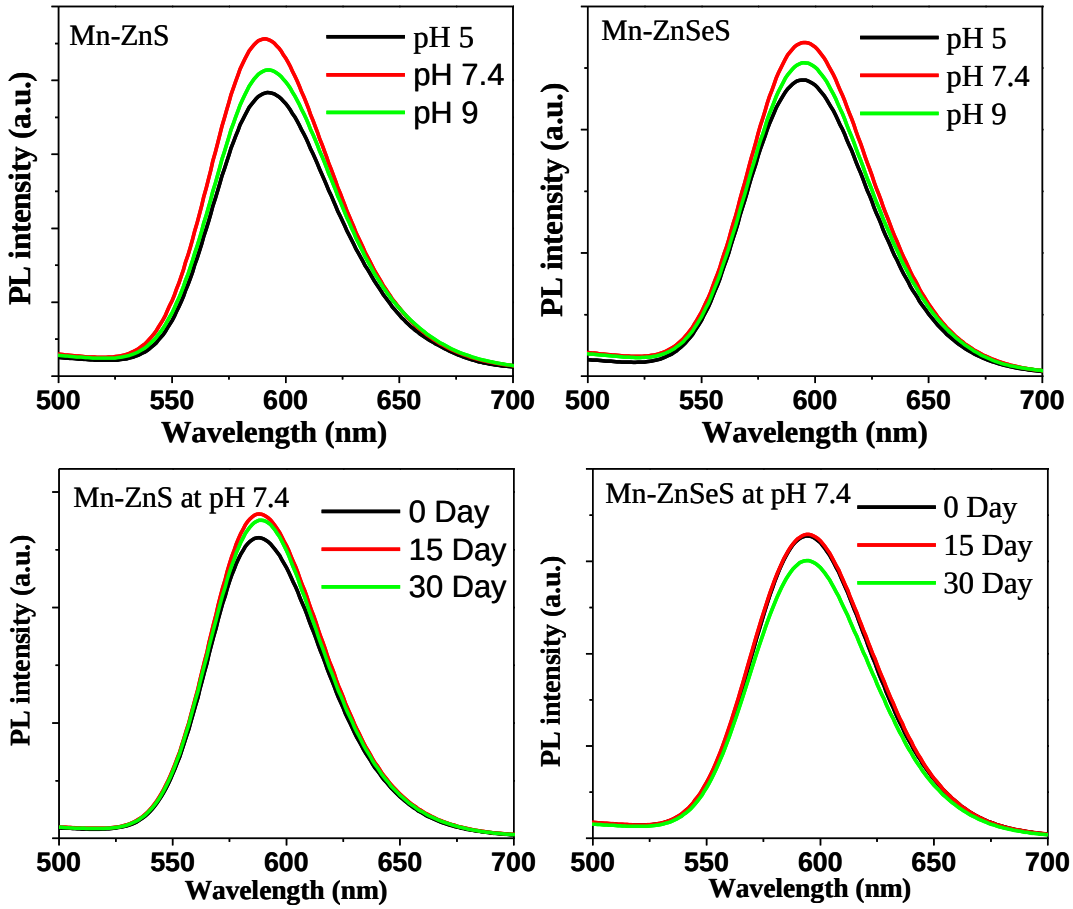

Figure S2. Colloidal stability of water soluble doped nanocrystals prepared via type I coating. The results indicate that the coated nanocrystals are highly stable at different pH and for several days without changing any significant loss of fluorescence intensity.

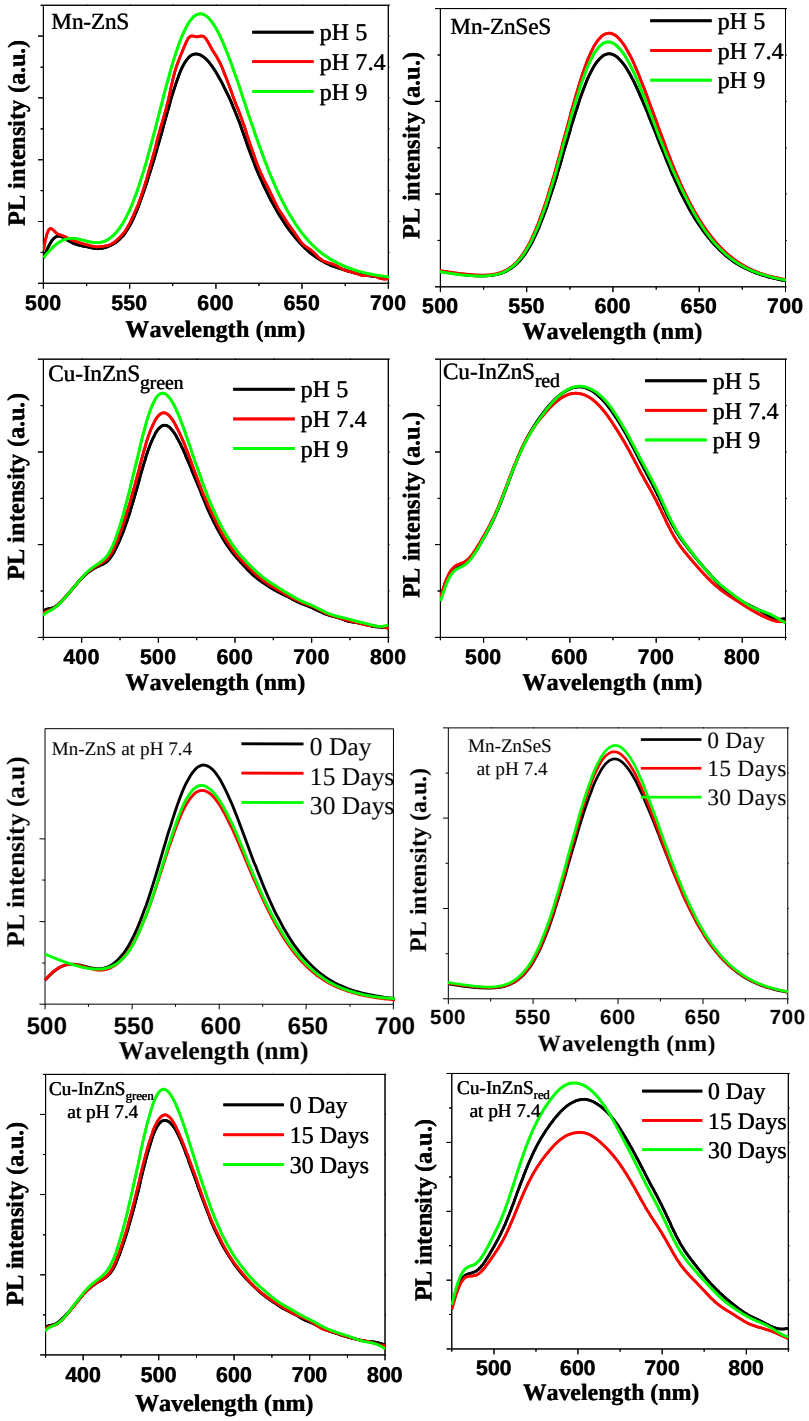

Figure S3. Colloidal stability of water soluble doped nanocrystals prepared via type II coating. The result indicates that the coated nanocrystals are highly stable at different pH and for several days without changing the fluorescence intensity.

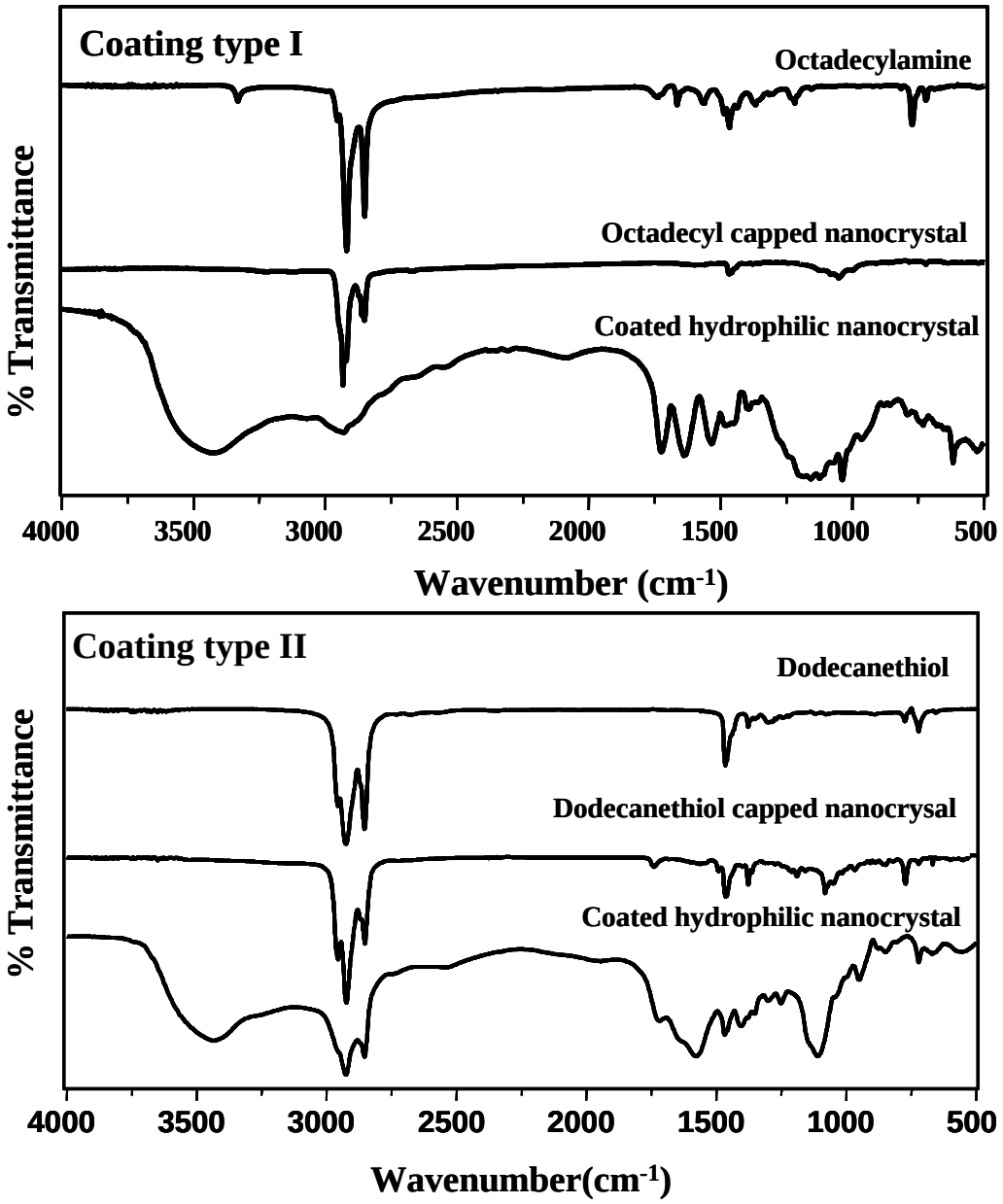

Figure S4. FTIR spectra of doped nanocrstals before and after coating. It is clear that in type I coating the existing ligand octadecylamine is completely replaced by polyacrylate that is indicated by disappearance of C-H stretching signals of -CH_2 group at 2850-2900 cm^{-1} and appearance of O-H and N-H broad stretching signals near 3400 cm^{-1}. In type II coating the C-H stretching at 2850-2900 cm^{-1} indicates that the existence of ligand dodecylamine and the appearance of new peak near 3400 cm^{-1} confirmed the presence of polymer coating with O-H and N-H stretching from –OH and –NH_2 functional groups.

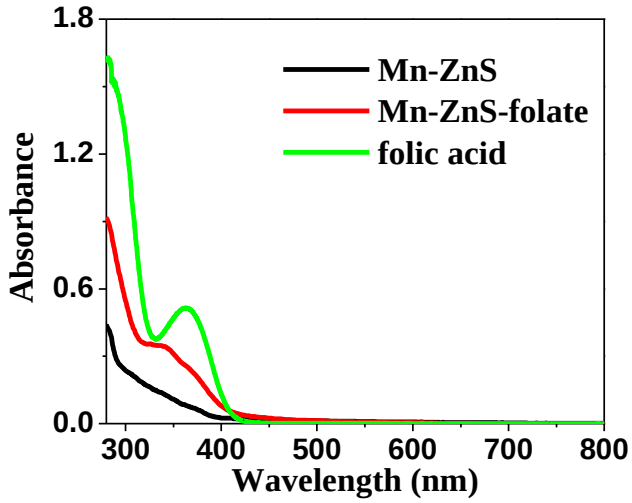

Figure S5. UV-visible spectra of Mn-ZnS before and after folate conjugation, showing the characteristic absorption peak at 360 nm due to folate.

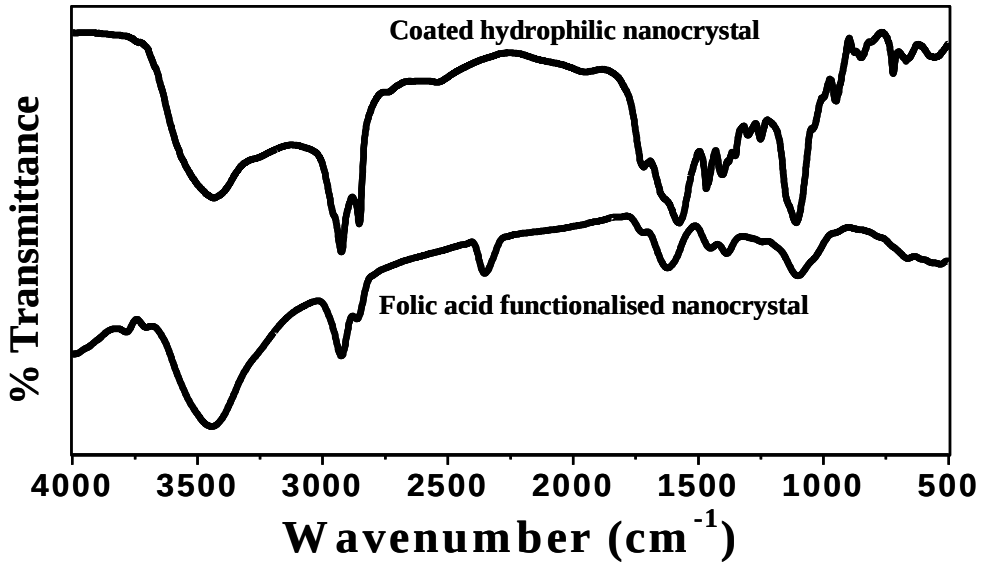

Figure S6. FTIR spectra of hydrophilic Cu-InZnS based doped nanocrystals before and after folic acid conjugation via type II coating. The N-H bending peak of $-NH_2$ group at 1576 cm^{-1} shifts to 1624 cm^{-1} after functionalisation, indicating successful folic acid functionalization with amine groups.

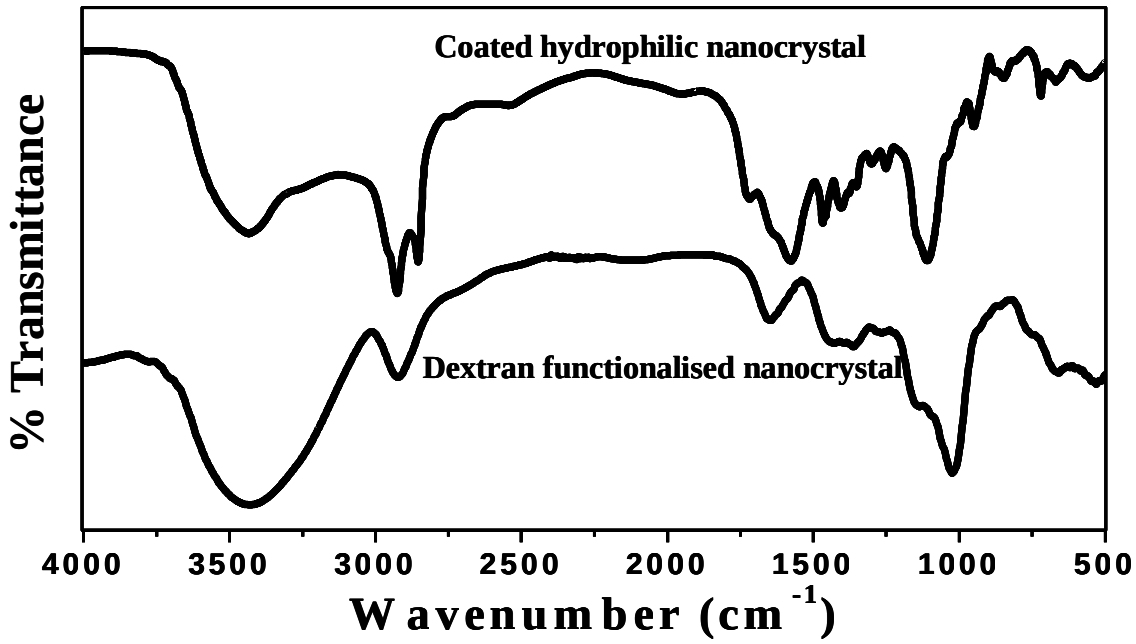

Figure S7. FTIR spectra of hydrophilic Cu-InZnS based doped nanocrystals before and after dextran conjugation via type II coating. The disappearance of N-H bending peak of -NH_2 group at 1580 cm^{-1}, appearance of new peak at 1020 cm^{-1} for C-OH stretching of dextran and broad –OH stretching frequency near 3435 cm^{-1} after functionalisation clearly indicate that dextran is successfully functionalized doped nanocrystals.

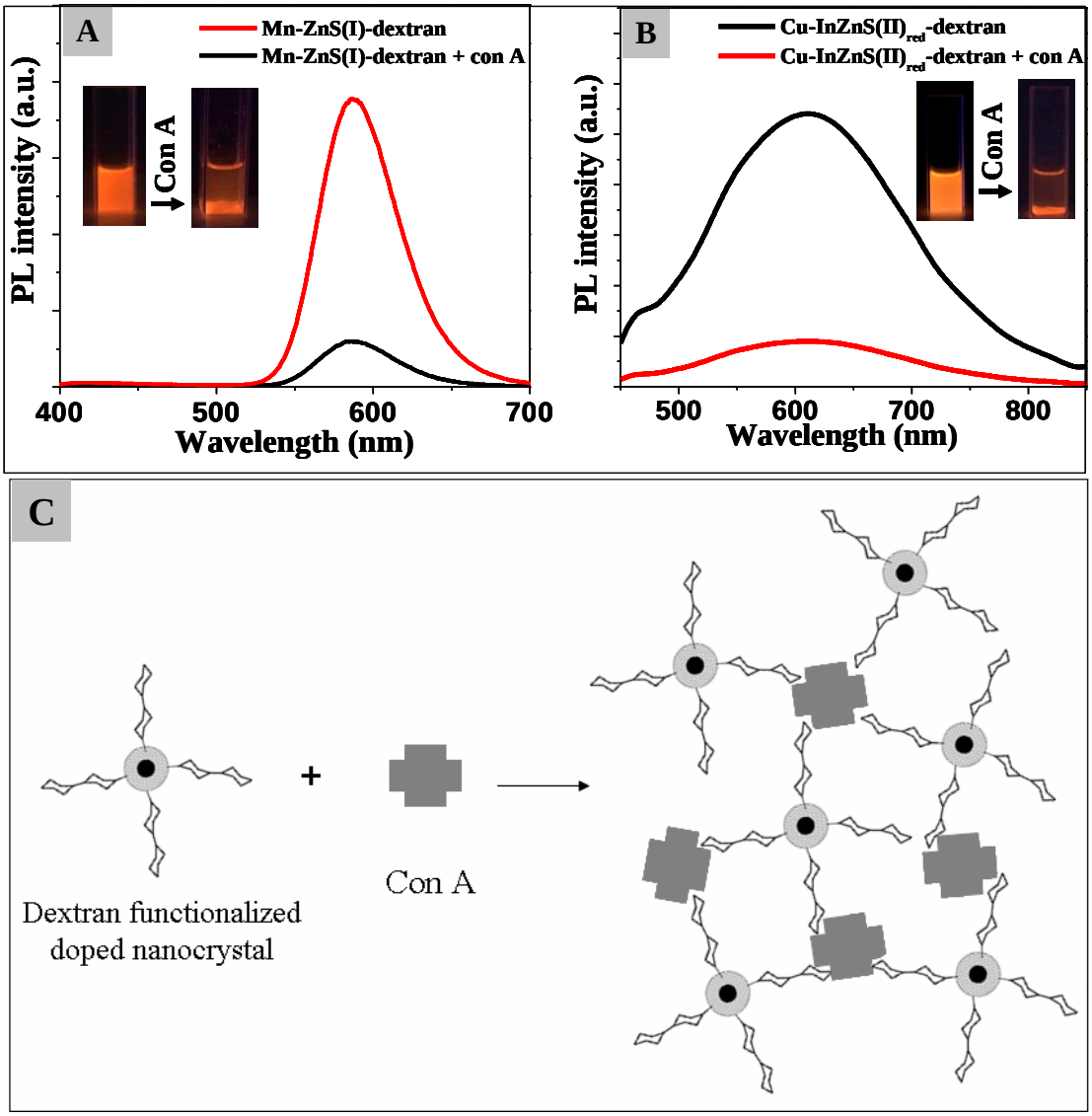

Figure S8. A and B) Precipitation based glycoprotein (con A) detection using dextran functionalized doped nanocrystals. (C) Schematics showing the nanoparticle aggregation via multivalent interaction between the functional nanoparticles and glycoproteins. I and II in the bracket indicates the types of coating used for the nanocryatals.

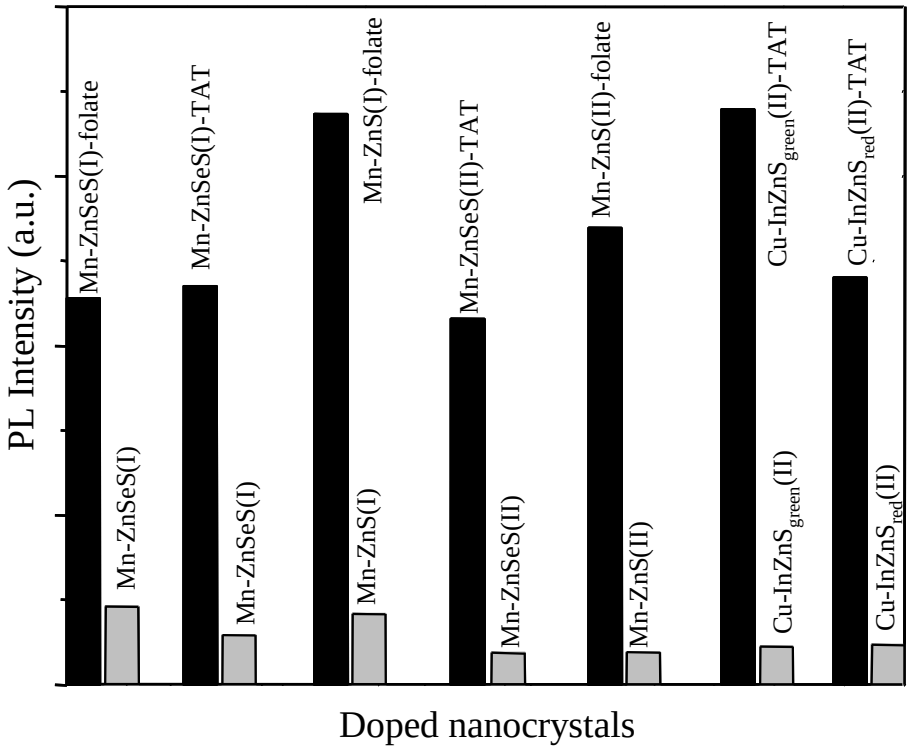

Figure S9. Microplate Reader based cellular uptake quantification study of different functionalized nanoparticles (black bars) along with control nanoparticles without functionalisation (gray bars), using the fluorescence property of doped nanoparticles present in labeled cells. Results clearly show that cellular uptake increases significantly after functionalization. I and II in the bracket indicates the types of coating used.

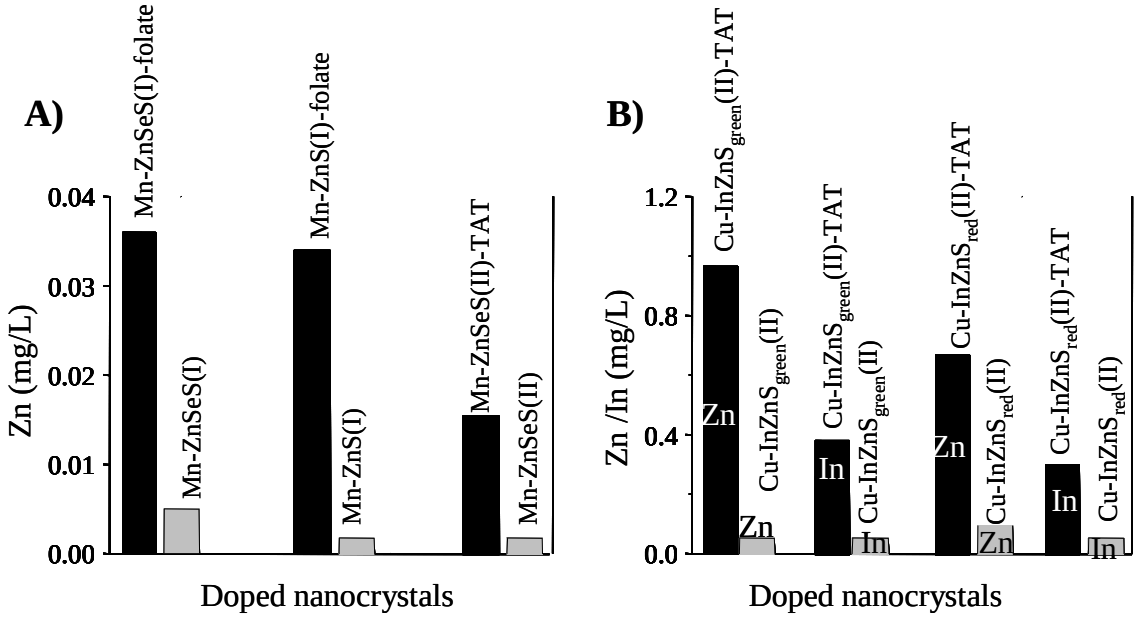

Figure S10. ICP-AES based quantification of cellular uptake of Mn-doped nanocrystals (A) and Cu-doped nanocryatals (B) with (black bars) and without (gray bars) functionalization. The labeled cells were used for quantification of Zn/In coming from doped nanocrystals. The results conclude that funtionalization increases the cell uptake of doped nanocrystals. I and II in the bracket indicates the types of coating used.

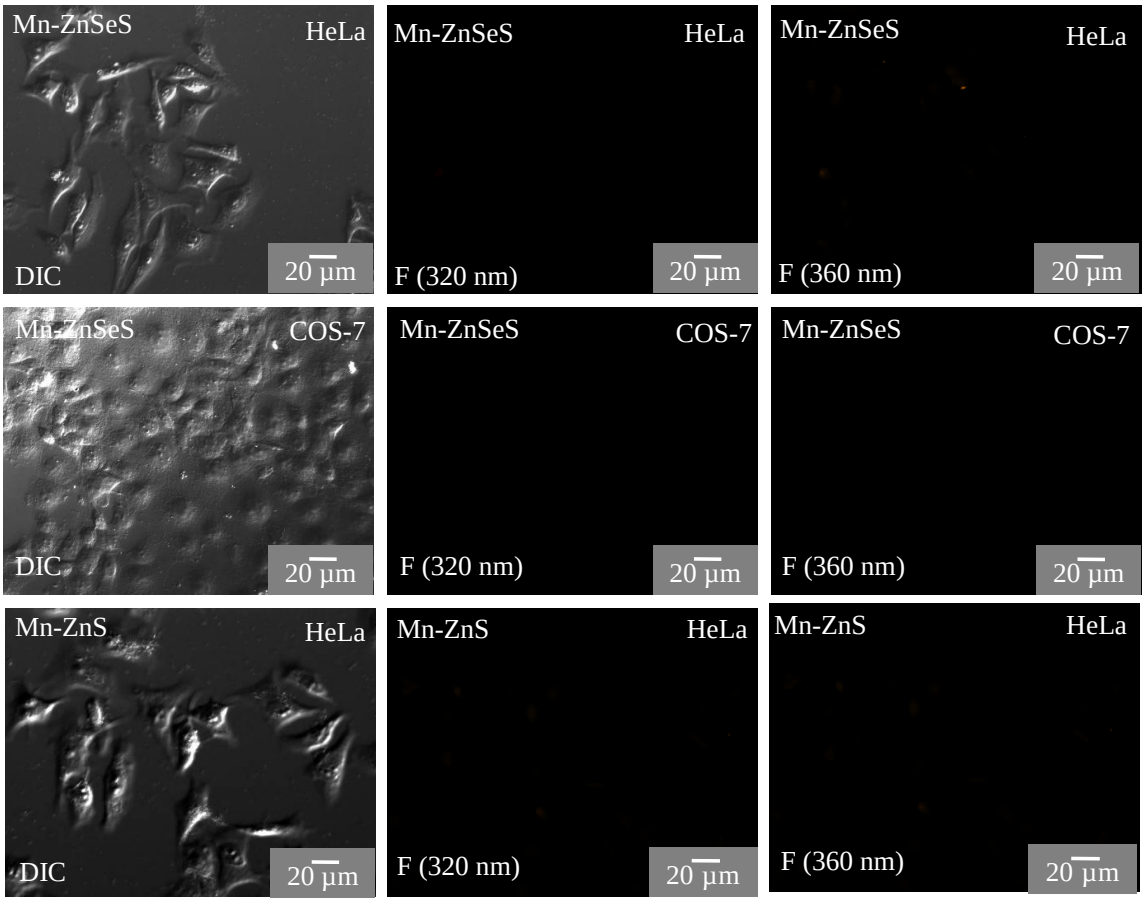

Figure S11. Differential interference contrast (DIC) and fluorescence (F) microscopic cellular images using control samples (without TAT/folate functionalization) prepared via type I coating, indicating that they do not label cells.

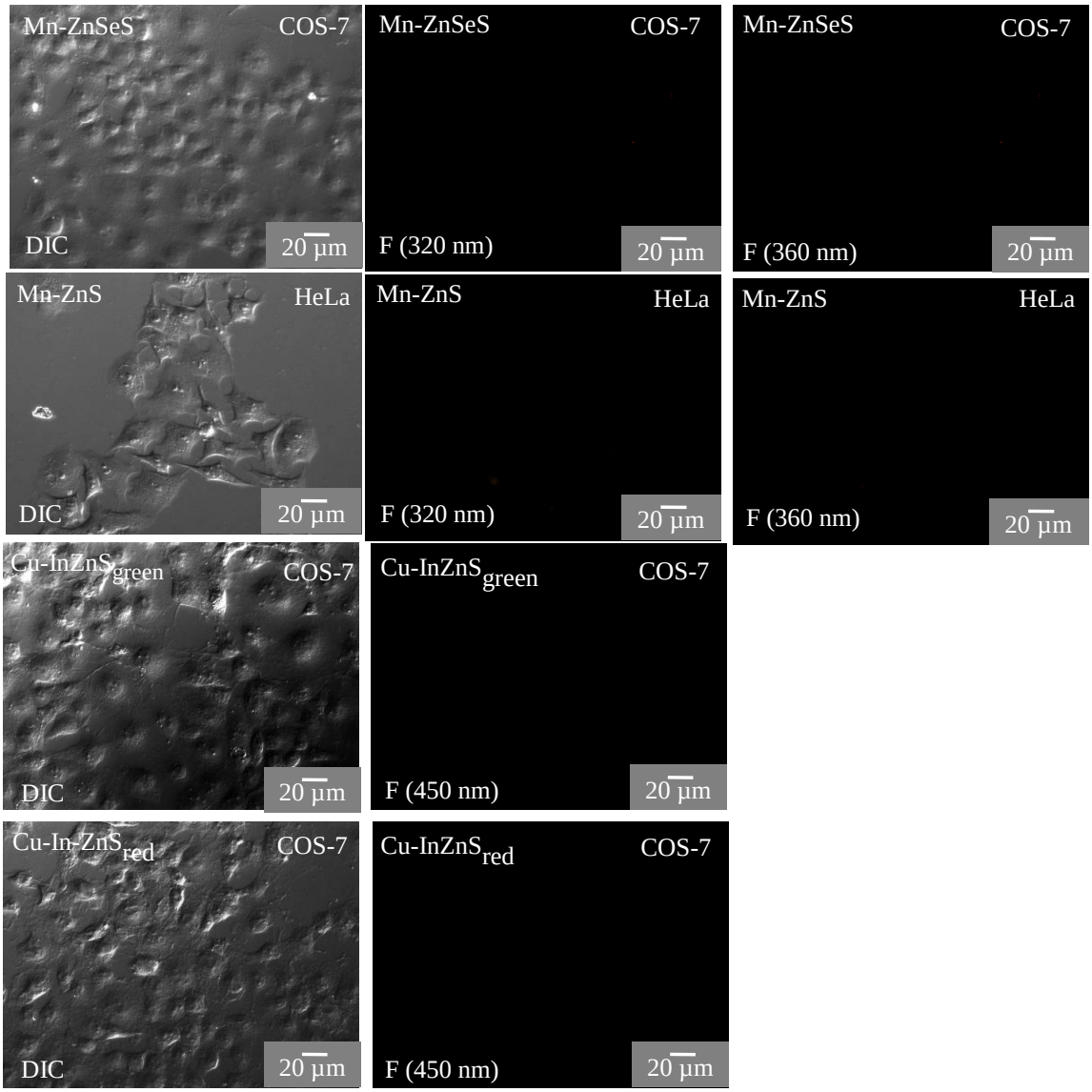

Figure S12. Differential interference contrast (DIC) and fluorescence (F) microscopic cellular images of control samples (without TAT/folate functionalization) prepared via type II coating, indicating that they do not label cells.

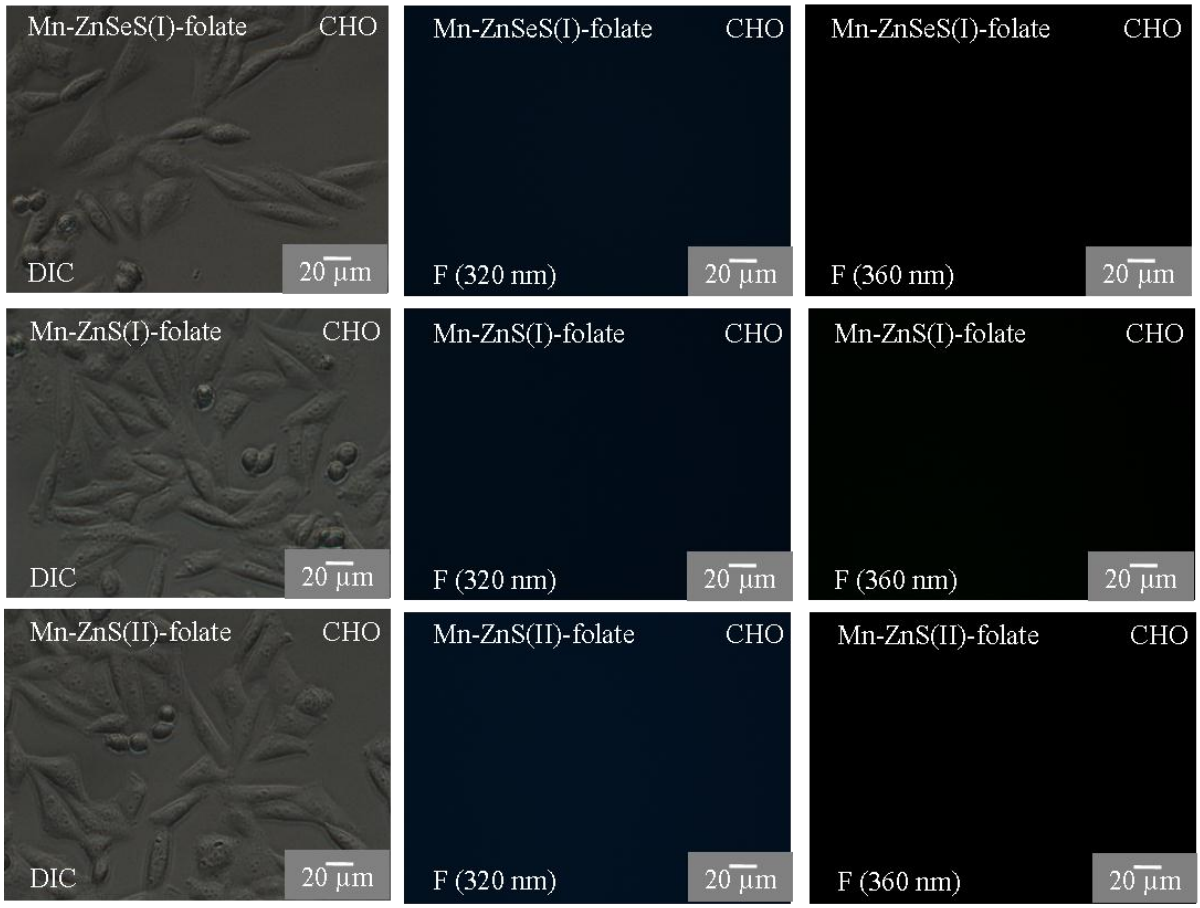

Figure S13. Differential interference contrast (DIC) and fluorescence (F) microscopic imaging of control CHO cell lines having poorly expressed folate receptors. Folate functionalized different doped nanocrystals have been used for cell labeling. Results indicate that nanocrystals do not label cells. I and II in the bracket indicates the types of coating used.