

Self-Assembled Binary Superlattices of CdSe and Au Nanocrystals and Their Fluorescence Properties

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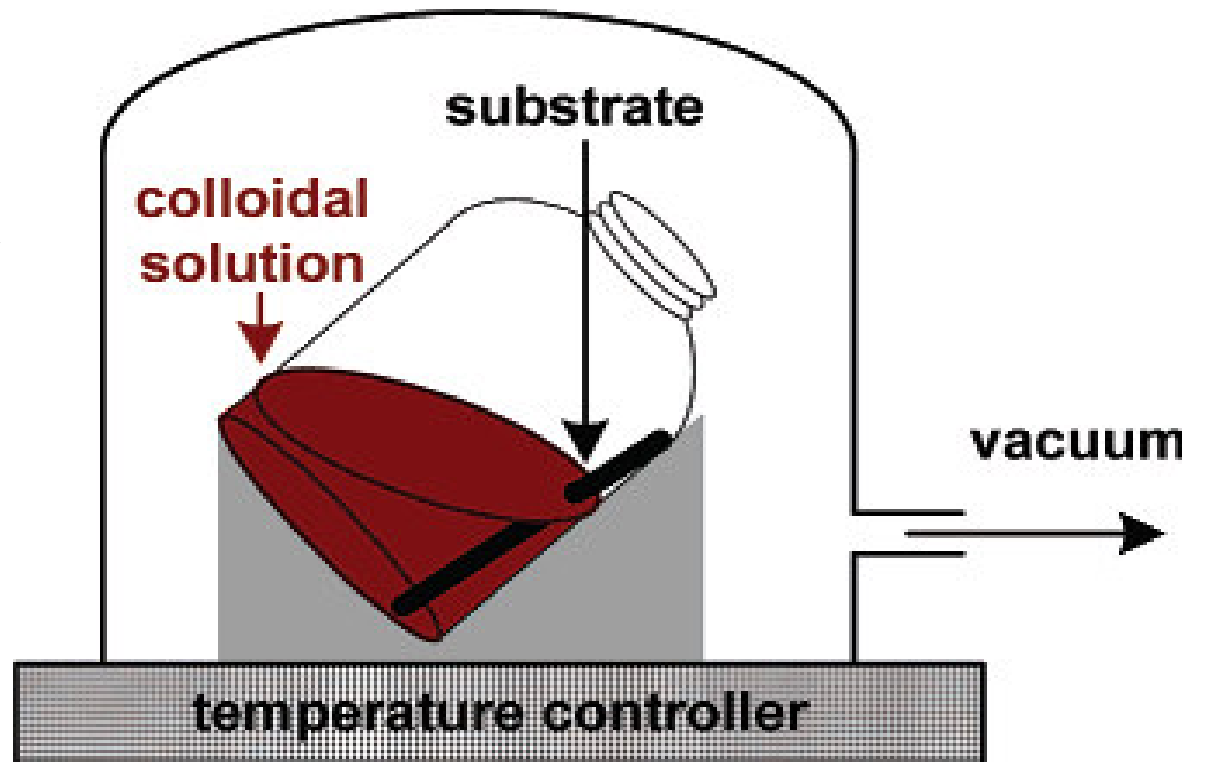
J. Am. Chem. Soc. 2008, 130, 3274-3275

Introduction

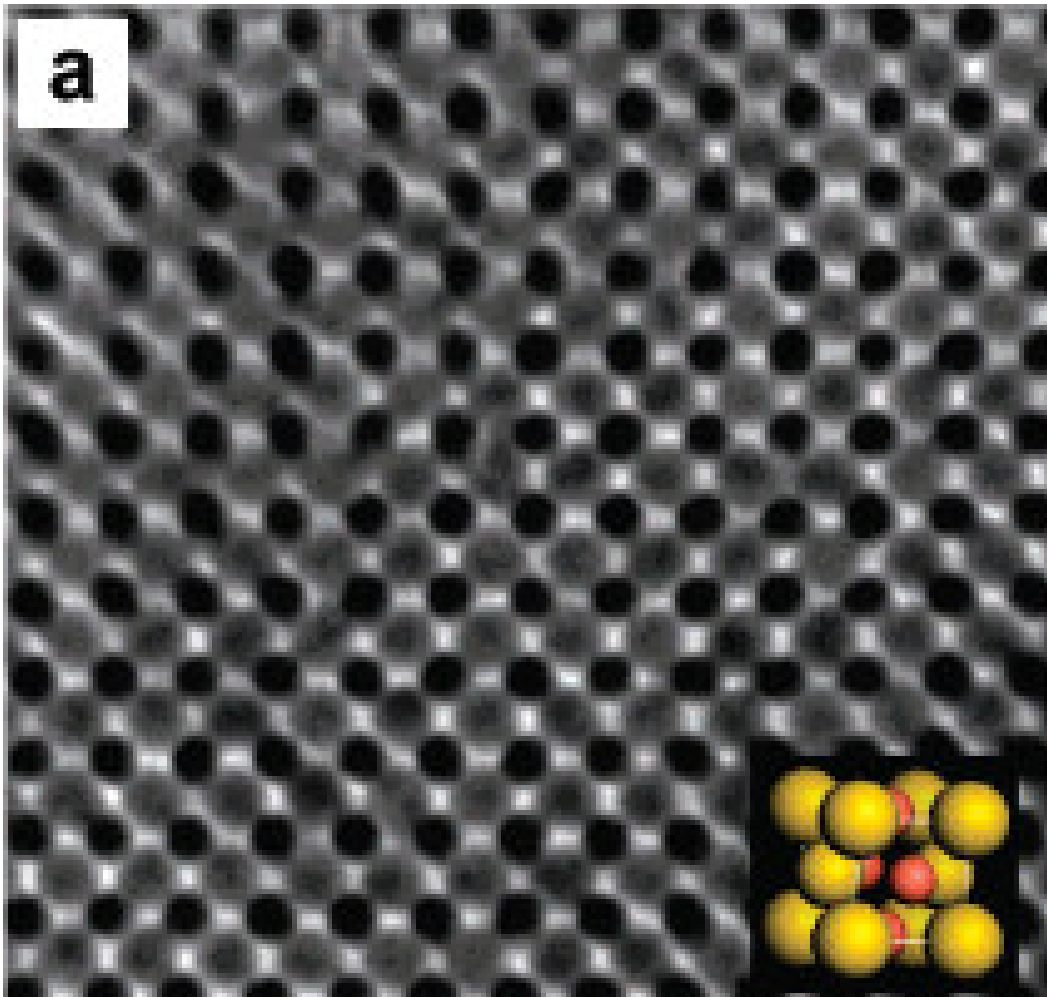
- Semiconductor and metal nanocrystals are important in many branches of Science and Technology not only due to their collective properties but also due to the new properties generated by the inter particle interactions at the nano scale.
- Interaction mechanism of Semiconductor nanoparticles with neighboring metal nanoparticles helps to understand the condition of the quenching of fluorescence of the semiconductor nanoparticles through a new nonradiative path generated by the metal nanoparticles.
- In this paper, they prepared the Binary nanoparticle superlattice of CdSe and Gold by the solvent evaporation method.

Preparation method

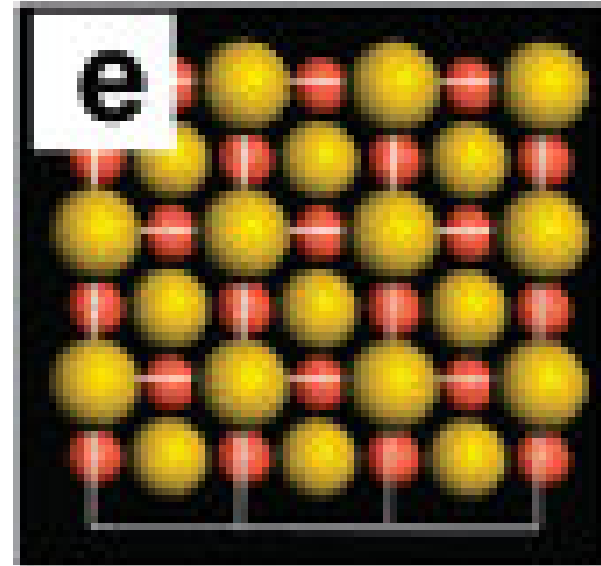
CdSe and Gold nanoparticles were synthesized in organic phase.



8.7 nm CdSe and 5.5 nm gold were mixed and solvent were evaporated using the above set up.

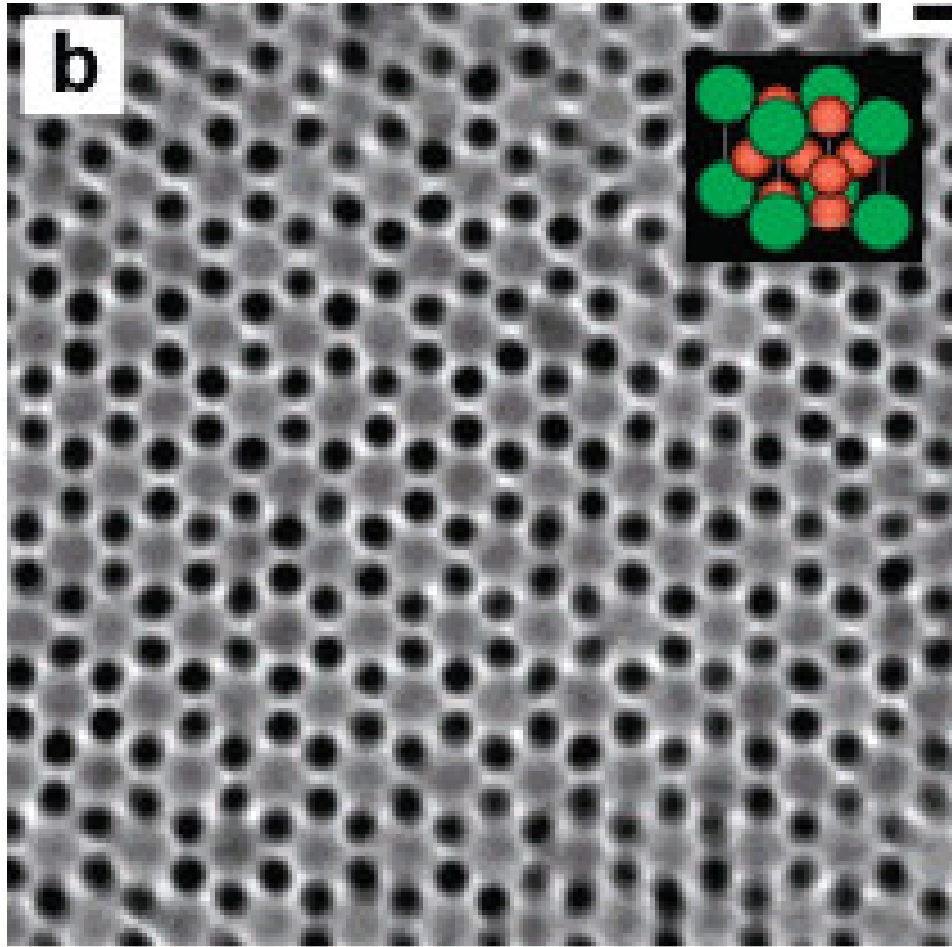


CdSe: Gold= 1:0.7

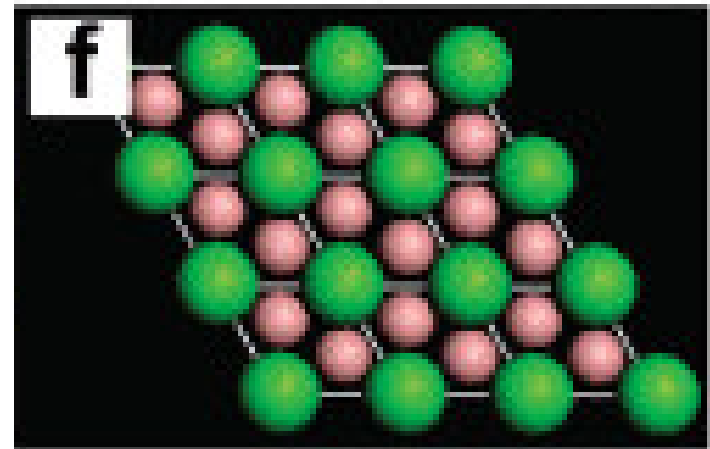


AuCu

BNSL isostructural with AuCu



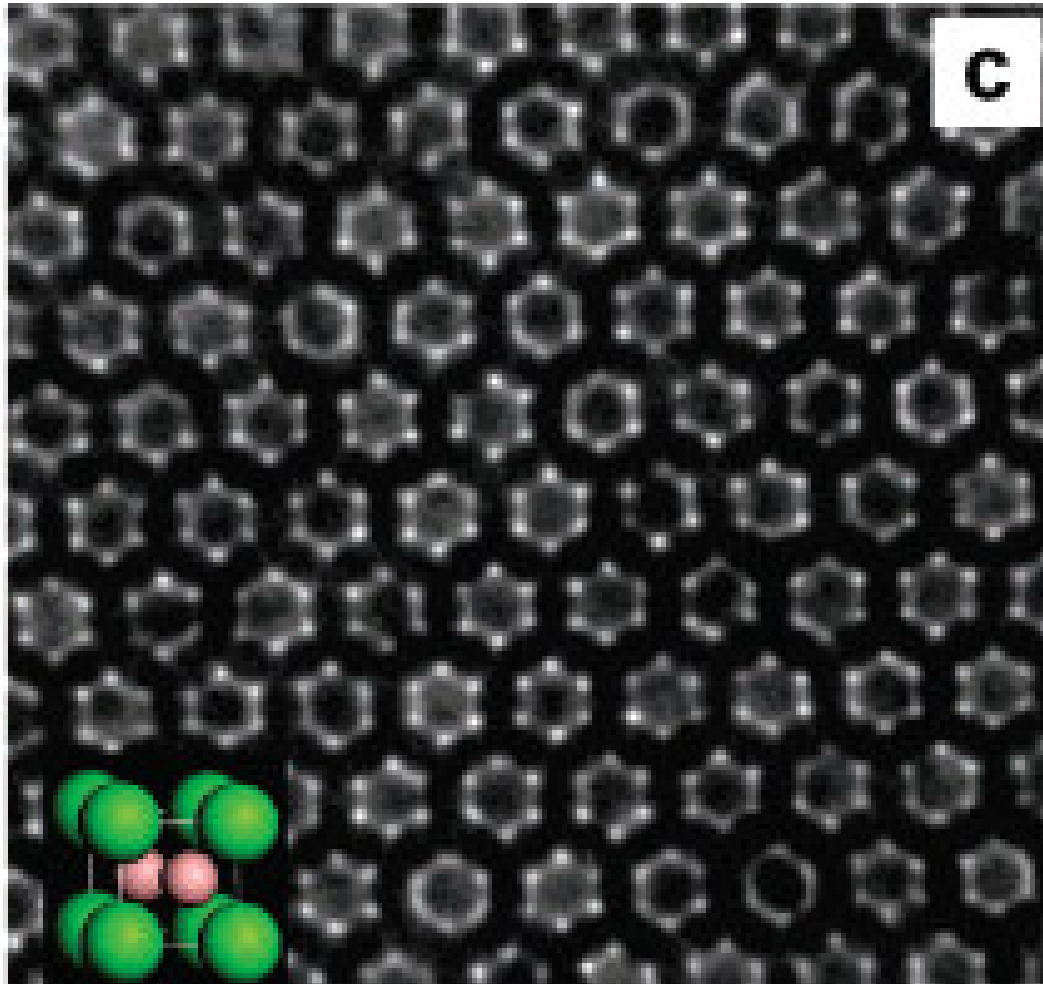
CdSe: Gold= 1:5



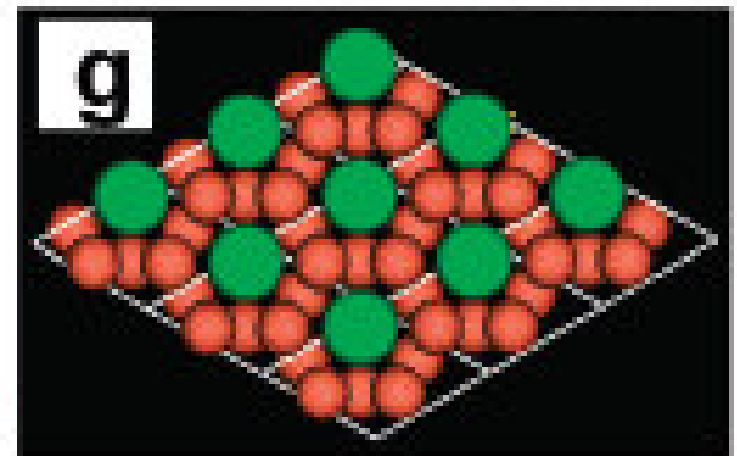
AIB₂

BNSL isostructural with AIB₂

dodecanethiol



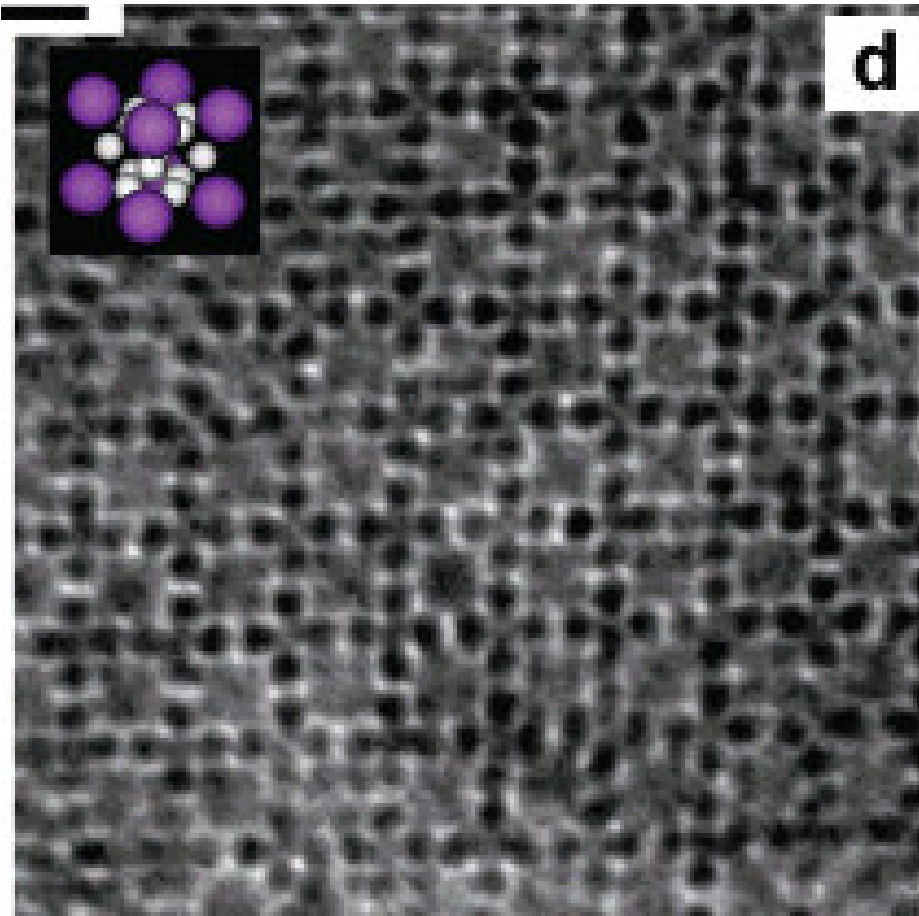
CdSe: Gold= 1:5



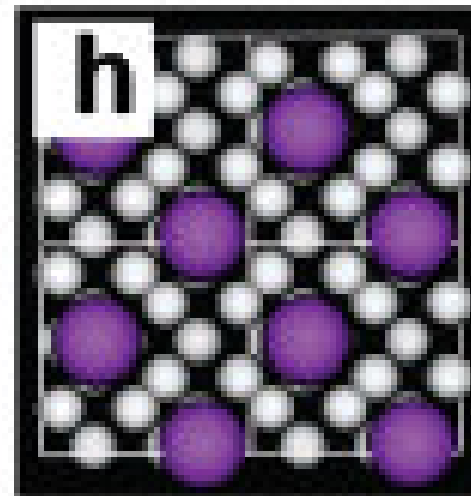
CaCu_5

BNSL isostructural with CaCu_5

trioctylphosphine oxide

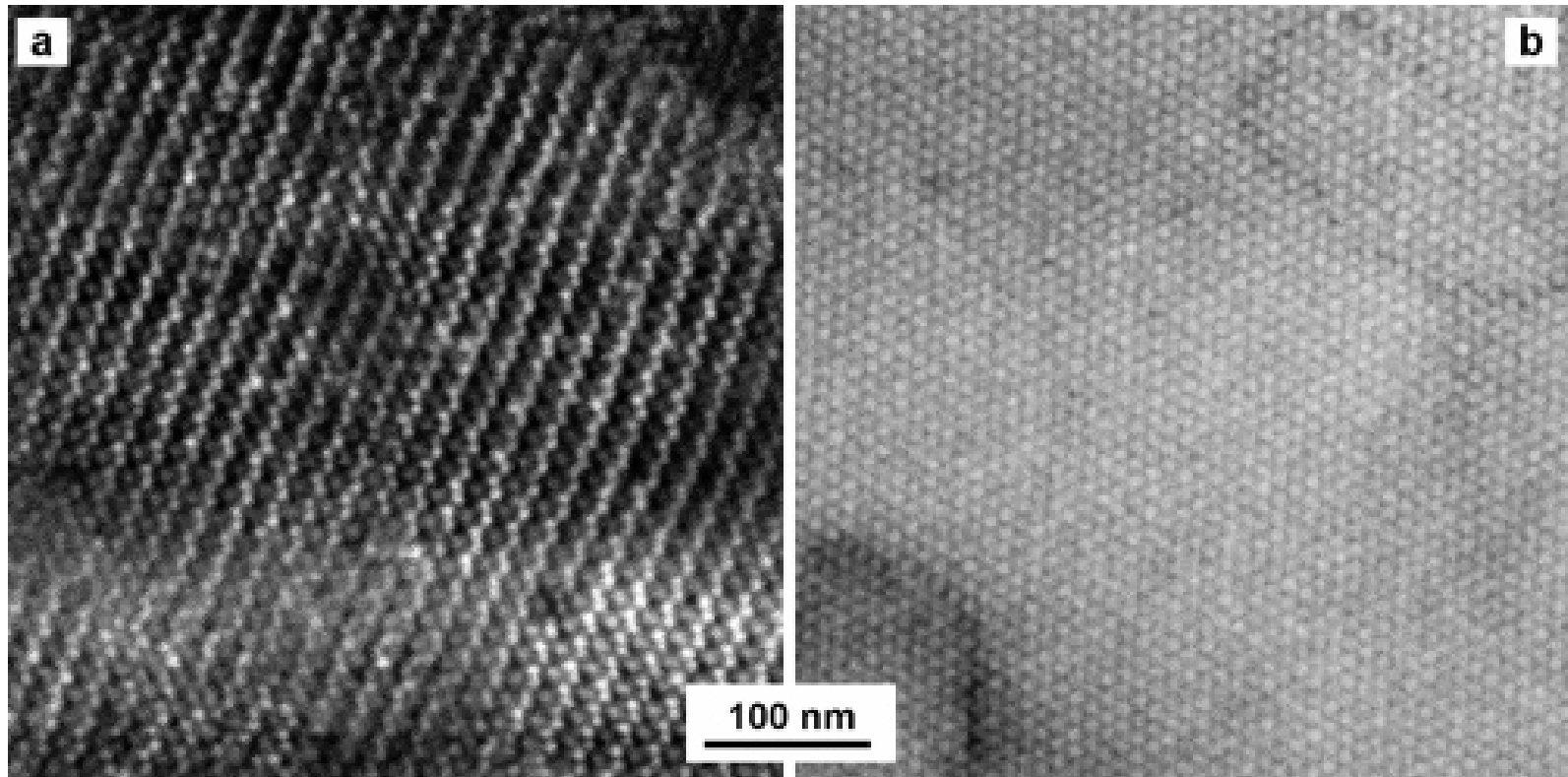


CdSe: Gold= 1:5

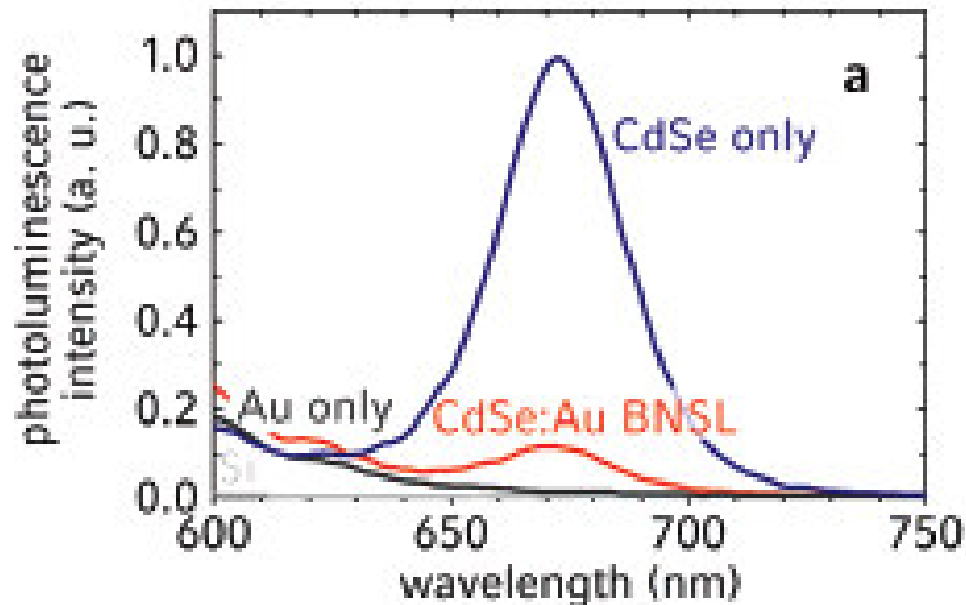


cub-AB₁₃

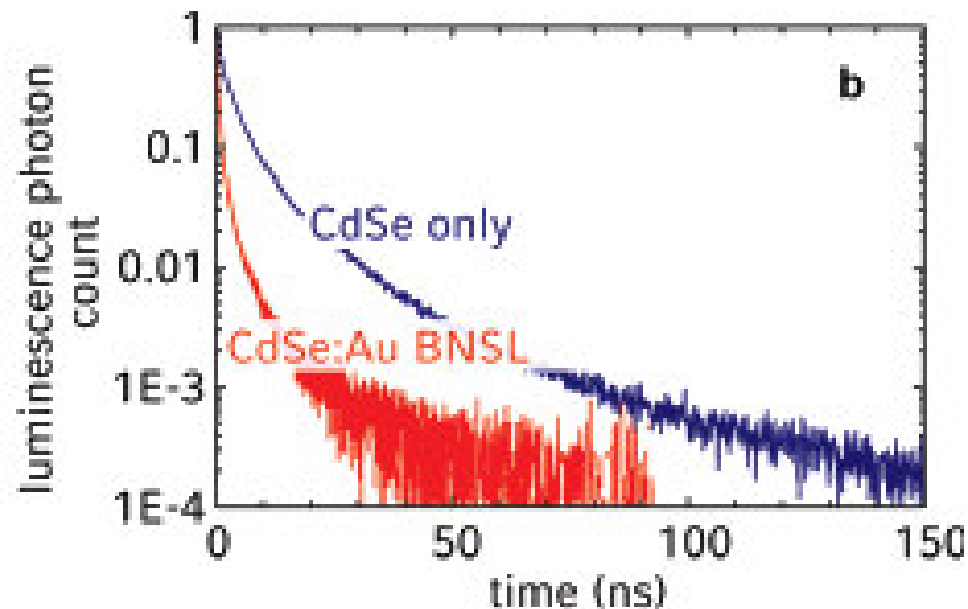
BNSL isostructural with Cub-AB₁₃



(a) HRSEM images of the CdSe/gold nanoparticle superlattice (AIB₂). (b) That of CdSe particle superlattice.



Life time of Binary= 0.45 ns
Life time of CdSe= 2.2 ns



The decrease in the emission intensity and life time of binary Superlattice compared to CdSe Nanoparticle superlattice is assumed due to the energy transfer From CdSe nanoparticle to surrounding Gold nanoparticles.

Conclusion

- Prepared the CdSe and gold nanoparticles in the organic phase.
- Nanoparticles were mixed in different ratio and prepared the BNSL in different pattern.
- The emission intensity and life time of the BNSL were found to be less compared to the pure nanoparticles. It is attributed due to the energy transfer from the CdSe to neighboring gold nanoparticles.