# Synthesis and optimization of the ZnSe:Cu QDs emission

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Abstract

ZnS and ZnS:Cu shell was grown on the ZnSe:Cu QDs by a simple method. Synthesized QDs wascharacterized by means of XRD, FESEM, UV-Vis and PL analysis.XRD pattern indicated cubicZinc-blend structure for all of the samples. Blue emission of the ZnSe QDs was converted to a greenemission after Cu doping. The PL intensity of the ZnSe:Cu QDs was increased considerably after ZnSshell growth and also it indicated a significantly incensement after insertion of the Cu dopant in the ZnS shell. The optimum value of the PL intensity was obtained for ZnSe:Cu(1.5%)/ZnS:Cu(0.05%).

**Synthesis of ZnSe:Cu and ZnSe:Cu/ZnS:Cu QDs:**

ZnSe:Cu QDs were prepared via the previously reported approach in our group [1]. For preparingZnSe:Cu/ZnS QDs. 0.066 g of Zn(Ac)2 was dissolved in 30 ml D.I water and then 0.05 ml of TGA was3added to that and pH value was adjusted at 9 by using NaOH. Then 10 ml of the ZnSe:Cu prepared QDswas added to this prepared solution slowly. The finally prepared solution was located under high pressureMercury lamp and was illuminated for different intervals. For preparing ZnSe:Cu/ZnS:Cu QDs a 0.025mlof Cu solution was added to the Zinc solution before TGA addition and all of the steps are same as theZnSe:Cu/ZnS.

**Results and discussions:**

XRD pattern of the ZnSe, ZnSe:Cu and ZnSe:Cu/ZnS QDs were shown in fig.1. The position of thethree peaks at 27.6, 45.8 and 54.2 correspond to the (111), (220) and (311) planes of the cubic-Zincblende structure of the ZnSe after Cu doping there is no peak related to the impurity but after ZnS shellgrowth (ZnSe:Cu/ZnS) because of the decreasing lattice parameter and according to the Bragg equation,diffraction peaks shifted to the higher angles.



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| Fig. 1. XRD pattern of synthesized QDs |
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Fig. 2 presents PL spectra of ZnSe, ZnSe:Cu, ZnSe:Cu/ZnS and ZnSe:Cu/ZnS:Cu QDs and inset is a

micrograph indicating emission of these synthesized QDs under UV-254 nm excitation. Clearly blueemission was converted to green emission after Cu doping and PL intensity was increased 2 times by ZnSshell growth and 4 times by ZnS:Cu shell growth



Fig. 2. PL spectra of the synthesized QDs

Conclusion

ZnSe:Cu QDs were synthesized by a photochemical approach and PL spectra of the ZnSe:Cu QDs were optimized by means of tuning different parameters.

References

[1] R. Khafajeh, M. Molaei and M. Karimipour, Luminescence. 32 (2017) 581-587Authors