SUMMARY OF THE PROJECT

"Synthesis, Surface modification, functionalization of semiconductor quantum dots of II-VI and fabrication of light emitting and photonic devices"

F. No. 41-1005/2012 (SR)
Period: 1-07-2012 to 30-6-2015

By

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UNIVERSITY GRANTS COMMISSION
BAHAURSHAH ZAFAR MARGNEW, NEW DELHI-110 002

Brief objectives of the Project:

The project aims to synthesise and characterise II-VI semiconductor quantum dots by ligand assisted methods. It is also envisaged to investigate the role of different ligands on the synthesis of QDs, since the photoluminescence properties of QDs depends on the size of quantum dots which depends on the nature and length of ligands used for the synthesis. Importance is given to study the various applications of nanocrystals such as fabrication of photonic device and biological applications of surface modified nanocrystals.

Work Done

The major objectives of the project as stated in the project proposal were successfully achieved, the major objectives are:

1. To synthesise II-VI semiconductor quantum dots by ligand assisted methods.
2. To characterise the structure of nano crystals as wurtzite or Zinc blend which depends on the length and nature of ligands used for the synthesis and to determine the size of quantum dots.

3. To fabricate photonic devices with semiconductor materials as well as with ligand substituted coordination compounds of nano crystals.
4. To study the light emitting properties of photonic devices constructed on a number of chemically grown nano crystals, CdS, CdSe, CdTe and ZnS as well as ligand encapsulated CdS, CdSe, CdTe and ZnS.
5. An attempt will be made to study the biological application of nanocrystals by surface modification and fabricating polymer composites with Ionophores.

B**ased on the proposal and work done we have generated some important results that have been published in International Journals:**

1. **Zinc Stannate nanoflower (Zn_2SO_4) photoanodes for efficient dye sensitized solar cells.**, M. Mary Jaculine, C. Justine Raj, Hee-je Kim, **A. Jeya Rajendran**, *Material Science in Semiconductor Processing*, Vol. 25, 52-58, 2013 (IF-2.4).
2. **Dielectric and conductivity studies of stero-selectivity synthesized d- and l-nor-ephedrine, A. Jeya Rajendran**, M. Prabhu, K. Eswara Moorthi, I. R Celine Rose, D. Santhanaraj, K. Sugandhi, S. Radhika, *J. Therm.Anal.Calori.,* 119(2015) 369-379. (IF 2.0)
3. **Exploring the effect of morphology of Ni and Co doped cadmium selenide nanoparticles as counter electrodes in dye-sensitized solar cell,** I.R. Celine Rose, A. Jeya Rajendran, Optik 155 (2018) 63–73 (IF-2.18).
4. **Effect of Dopants on the Performance of ZnSe Nanoparticles as Photocathode for Dye Sensitized Solar Cell**, Rose CIR, Raj MF and Rajendran JA, *J Nanomater Mol Nanotechnol*., 2018, 6, 6 (IF-3.0)

Book Chapter…..

F. Michael Raj and A. Jeya Rajendran contributed a chapter entitled "**Modified CdS nanoparticles as photocathode for a solar cell"** in the book "Recent Trends in Materials Science and Applications" published by Springer, 2017. (ISBN 978-3-319-44889-3) https://doi.org/10.1007/978-3-319-44890-9-16

M. Phil and Ph. D Guided

M.Phil - 05

Ph.D. - 02

1. Investigation of CdSe and ZnSe nanoparticles as counter electrodes in DSSC by **Ms. I.R. Celine Rose**
2. Synthesis and Characterization of nanostructured CdS, ZnS, and ZnO as Electrode Material For Dye-Sensitized for Dye-Sensitized Solar Cell by **Mr. F. Michael Raj**

Whether objectives were achieved: Yes

Achievements from the Project....

1. As per the original proposal, uniform and consistent development of fabrication of solar cell with high efficiency was achieved.
2. Metal complexes were synthesized that were used as sensitizers to replace ruthenium based complex as sensitizers.

Signature of the Principal Investigator

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