# Dr. C.K. SUMESH

*Assistant Professor*

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## Background

B. Sc., Physics, Kannur University, Kerala , 2001

M. Sc., Physics, Sardar Patel University,Gujarat, 2003

Ph.D., Physics, Sardar Patel University, Gujarat, 2009

## Teaching Experience

Assistant Professor, Department of Physical Sciences at PDPIAS, Charotar University of Science and Technology (CHARUSAT), Changa, Gujarat from 8th January 2009.

## Research Interests

### Research area:

- Fabrication, Treatment, and Testing of Materials and Structures
- Electronic transport properties of Semiconductors (crystal, thin film and nanostructures) and
- Photodetector applications of Metal semiconductor Structures and Heterogonous nanostructures
- Photo-electrochemical applications of 2D layered nanomaterials and hybrids for environmental remediation and energy storage

### Research Experiences:

(i) Research Publications in Peer Reviewed Journals

National & International (40)

(ii) Research presentations in conferences/Symposium

| Oral (03) | Poster (04) |
|---|---|

(iii) Conferences/Workshops attended

| National (05) | International (02) |
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(iv) Conferences/Workshops Conducted (20)

## No. of Students Guided - UG, PG and Research

(i) Ph.D. : 03 (01 Completed; 02 in Progress

(ii) Dissertation project: 18 (M.Sc. Physics)

## Fellowship/Award:

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|---|---|
| 2018 | VISITING FELLOWSHIP PROGRAM 2017-2018, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore |
| 2019 | INSA Visiting Scientist -2019 |

## Research Collaborations

Prof. K D Patel

Department of Physics

Sardar Patel university

Vallabh Vidyanagar, Aannd, Gujarat

Prof. Dr. Sebastian C. Peter

New Chemistry Unit

Jawaharlal Nehru Centre for Advanced Scientific Research

Jakkur, Bangalore

Prof. D N Srivastava

CSIR Central Salt & Marine Chemicals Research Institute

(CSMCRI), Bhavnagar, Gujarat

Dr.Dattatray Late

Physical and Materials Chemistry Division

CSIR-National Chemical Laboratory, Pune

## List of publications (published in SCI Journals, in year wise descending order)

1. Meswa Patel, Pratik Pataniya, Hitesh Vala, **C. K. Sumesh** "One-Dimensional/Two-Dimensional/Three-Dimensional Dual Heterostructure Based on $MoS_2$-Modified ZnO-Heterojunction Diode with Silicon" J. Phys. Chem. C 123, 36, 21941-21949 **(2019).**
2. **C. K. Sumesh** and Sebastian C. Peter "Two-Dimensional Semiconductor Transition Metal Based Chalcogenide Based Heterostructures for Water Splitting Applications" Dalton Trans., 2019, 48, 12772–12802 **(2019)**.
3. Vijay Dixit, Salil Nair, Jolly Joy, C.U. Vyas , Alkesh B. Patel, Payal Chauhan, **C.K. Sumesh**,Som Narayan, P.K. Jha, G.K. Solanki, K.D. Patel, and V.M. Pathak "Growth and application of WSe2 single crystal synthesized by DVT in thin fillm hetero-junction photodetector" Eur. Phys. J. B 92: 118 **(2019)**

4. Pratik Pataniya, Chetan K. Zankat, MohitTannarana, **C. K. Sumesh**, Som Narayan, G. K. Solanki, K. D. Patel, V. M. Pathak, Prafulla K. Jha "Paper Based Flexible Photodetector Functionalized by WSe2 Nanodots" ACS Appl. Nano Mater.2,5, 2758-2766 **(2019).**
5. Abhishek Patel, Pratik Pataniya, G.K. Solanki, **C.K. Sumesh,** K.D. Patel, V.M. Pathak "Fabrication, photoresponse and temperature dependence of n-$VO_2$/n-$MoSe_2$ heterojunction diode" Superlattices and Microstructures 130, 160-167 **(2019)**.
6. **C. K. Sumesh "**Temperature dependent electronic charge transport characteristicsat $MX_2$(M = Mo, W; X = S, Se)/Si heterojunction devices" Journal of Materials Science: Materials in Electronics; 30, 4117–4127 (**2019).**
7. **C. K. Sumesh** "Towards efficient photon management in nanostructured solar cells: Role of 2D layered transition metal dichalcogenide semiconductors" Solar Energy Materials and Solar Cells **192** 16–23**(2019).**
8. ***C. K. Sumesh*** and Kinnari Parekh "Nano catalytic Physico-chemical adsorption and degradation of organic dyes" Pramana – Journal of Physics (2019) 92:87 DOI:10.1007/s12043-019-1760-0 **(2019).**
9. SanniKapatel, **C. K. Sumesh** "Two Step Facile Preparation of MoS2·ZnO Nanocomposite as Efficient Photocatalyst for Methylene Blue (Dye) Degradation" 15,119–132 **(2019).**
10. Pratik Pataniya, G. K. Solanki, Chetan K. Zankat, MohitTannarana, **C. K. Sumesh,** K. D. Patel, V. M. Pathak "Fabrication and photoresponse of n-WS2/p-$V_{0.25}W_{0.75}Se_2$ Van der Waals hetero junction" Pramana – Journal of Physics, 91:41 **(2018).**
11. Abhishek Patel, Pratik Pataniya, Som Narayan, **C.K. Sumesh**, V.M. Pathak, G.K. Solanki, K.D. Patel, Prafulla K. Jha "Investigation of structural, electrical and optical properties of $SbXW_1$-$XSe_2$ single crystals" Materials Science in Semiconductor Processing, **81** 108–112 **(2018).**
12. **C. K. Sumesh,**SanniKapatel, and Arti Chaudhari "An approach for scalable production of silver (Ag) decorated WS2 nanosheets"AIP Conference Proceedings, 1961 030003 **(2018).**
13. Salil Nair, Jolly Joy, K. D. Patel, Pratik Pataniya, G. K. Solanki, V. M. Pathak, and **C. K. Sumesh** "Effect of doping on all TMC vertical heterointerfaces" AIP Conference Proceedings 1961, 030008 (**2018).**
14. Pratik Pataniya, G K Solanki, K D Patel, V M Pathak and **C K Sumesh "**Crystal growth, characterization and photo detection properties of 2H–V0.75W0.25Se2 ternary alloy with 1T–VSe2 secondary phase" Mater. Research Express 4 106306 **(2017)**
15. SanniKapatel, Chandresh Mania**, C. K. Sumesh** "Salt assisted sonochemical exfoliation and synthesis of highly stable few-to-monolayer WS2quantum dots with tunable opticalproperties" J Mater Sci: Mater Electron,Springer **28** 7184 **(2017).**
16. SanniKapatel, **C.K. Sumesh**, Pratik Pataniya, G.K. Solanki, and K.D. Patel "Layer-engineered I-V characteristics of p-Si/$WS_2$ Van der Waals Heterostructure diode Eur. Phys. J. Plus 132 191 **(2017).**
17. G.K. Solanki, Pratik Pataniya, **C.K. Sumesh**, K.D.Patel, V.M. Pathak "Excitonic emission and absorption resonances in V0.25W0.75Se2 single crystals grown by direct vapour transport technique" Journal of Crystal Growth,**441** 101-106 **(2016)** http://dx.doi.org/10.1016/j.jcrysgro.2016.02.018 (2016).
18. SanniKapatel and ***C. K. Sumesh*** "One Pot Sono-Chemical Synthesis of 2D Layered $MoS_2$ Nanosheets" AIP Conference proceedings, 1728, 020131,2016.doi: 10.1063/1.4946182.
19. ***C. K. Sumesh***, Bhavin Patel and Kinnari Parekh "UV Light Induced Photodegradation of Organic Dye by ZnO Nanocatalysts" AIP Conf. Proc. 1536, 123 (2013).
20. ***C. K. Sumesh*** *and K.D. Patel* "Analysis of barrier height inhomogeneities in Al-pSnSeSchottky diode"Eur. Phys. J. Appl. Phys. **59**10103 **(2012).**
21. ***C. K. Sumesh,*** *K.D. Patel, V.M. Pathak and R.Srivasthava"*Barrier height inhomogeneities in Cu-*n*$MoSe_2$ Schottky diode*"*Eur. Phys. J. Appl. Phys. **56** 10103 (2011).

22. *Achamma John Mathai, **C K Sumesh,** B P Modi*"Schottky Barriers on Layered Anisotropic Semiconductor – $WSe_2$ – with 1000 Å Indium Metal Thickness" Materials Sciences and Application **2**1000 (2011).
23. ***C. K. Sumesh,** K.D. Patel, V.M. Pathak and R.Srivasthava* "Metal-semiconductor field-effect transistors fabricated using DVT grown n-MoSe2 crystals with Cu-schottky gates" J. Nano- Electron. Phys.**3** 709 (2011).
24. ***C. K. Sumesh,** K.D. Patel, V.M. Pathak and R.Srivasthava*"Current transport in Copper Schottky contacts to a-plane/c-plane n-type $MoSe_2$"Chin. Phys. Lett.**28** 087201 (2011).
25. ***C. K. Sumesh,** K.D. Patel, V.M. Pathak and R.Srivasthava*"Low temperature Hall effect studies of InSb thin films grown by flash evaporation" Eur. Phys. J. Appl. Phys.**54**10303 (2011).
26. ***C. K. Sumesh,**K.D. Patel, V.M. Pathak and R.Srivasthava*"Analysis of current - voltage - temperature characteristics of In and Cu contacts on n-type $MoSe_2$ single crystals" Cryst. Res. Technol. **46** 61 – 64 (2011).
27. ***C. K. Sumesh,** K.D. Patel, V.M. Pathak and R.Srivasthava*"Low Temperature Electrical Transport Properties in p-SnSe Single Crystals" Eur. Phys. J. Appl. Phys. **53** 10302(2011).
28. ***C. K. Sumesh,** K.D. Patel, V.M. Pathak and R.Srivasthava*"Current transport Characteristics of pSe-n$MoSe_2$ Heterojunction Diode" Eur. Phys. J. Appl. Phys.**52**30302 (2010).
29. ***C. K. Sumesh,** K.D. Patel, V.M. Pathak and R.Srivasthava*"Specific contact resistance at In-n$MoSe_2$ Interfaces" Journal of Electron Devices: Solid State Devices **8** 324-329 (2010).
30. ***C. K. Sumesh,** K.D. Patel, V.M. Pathak and R.Srivasthava*"Investigation of carrier scattering mechanisms in molybdenum diselenide single crystals by hall effect measurements" Cryst. Res. Technol. **45**957 – 960 (2010).
31. ***C. K. Sumesh,** K.D. Patel, V.M. Pathak and R.Srivasthava*"A comparative study on stability of Ohmic contacts to molybdenum diselenide semiconductors" International Journal of Advanced Engineering Technology**,** IJAET **I**, 37-45 (2010).
32. ***C. K. Sumesh,** K.D. Patel, V.M. Pathak and R.Srivasthava "*Current transport mechanisms studied by I-V-Tmeasurement on Cu-n$MoSe_2$ Schottky diode" Journal of Optoelectronics and Advanced Materials, **11** 1718 – 1722 (2009).
33. ***C. K. Sumesh,** K.D. Patel, V.M. Pathak and R.Srivasthava*"Growth, physical, structural and chemical characterization of layered semiconductor molybdenum diselenide" Journal of Ovonic Research **4**61 – 68 (2008).
34. ***C. K. Sumesh,** K.D. Patel, V.M. Pathak and R.Srivasthava*"Twofold conduction mechanisms in molybdenum diselenide Single crystals in the wide temperature Range of 300k to 12k" Chalcogenide Letters **5** 177-180 (2008).
35. ***C. K. Sumesh,** K.D. Patel, V.M. Pathak and R.Srivasthava*"An insight to improved van der Pauw factor and their stability in the temperature range 300K-10K of layered semiconducting material, molybdenum diselenide single crystals." Chalcogenide Letters **5** 303-308 (2008).
36. ***C. K. Sumesh,** K.D. Patel, V.M. Pathak and R.Srivasthava*"Native defects in $MoSe_2$ crystals grown by direct vapor transport"*PRAJNA* - Journal of Pure and Applied Sciences **18** 129 - 131 (2010).
37. ***C. K. Sumesh,**Achamma John Mathai, K.D. Patel, V.M. Pathak and R.Srivasthava*"Low temperature transport properties of n-$WSe_2$ single crystals" '*PRAJNA* - Journal of Pure and Applied Sciences **16** 101-109 (2008).