

FACULTY MEMBERS' ACADEMIC PROFILE

1. Name of the Faculty member: Dr. SUBHADIP NATH

2. Designation: Assistant Professor in Physics (W.B.E.S.)

3. Qualification: M.Sc. (University of Kalyani);

Ph.D. (University of Kalyani)

4. Specialization: Condensed Matter Physics

5. E-mail address: subha.31connect@gmail.com

6. Date of Joining in W.B.E.S.: 26.02.2015

7. Date of Joining in this College: 26.02.2015

8. Total Teaching experience in College level: 8+ years

9. Research interests: High Temperature Superconductivity, Electron-Phonon Interactions, Density Functional Theory, Graphene and its Allotropes

10. Title of thesis (Ph.D.) with year: "A Study on some aspects of High temperature Superconductivity using Hubbard Model and its variants" (Awarded in March, 2017)

a) **Research guidance:** Registered as Co-supervisor at University of Calcutta,

Ph.D student : Krishnansu Basak, University of Calcutta

11. Research Projects (Completed and ongoing): Nil

12. List of publications:

A) Published papers in Journals:

1. "Finite Temperature Properties of the 2D Hubbard Model extended by Next-Nearest-Neighbor Hopping Interaction", **S. Nath** and N. K. Ghosh, *Indian Journal of Physics*, **2012**, 86(5), 351-356 [ISSN 0973-1458; IF: 1.242].
2. "On-site and Inter-site Electron-Phonon Interaction in 2D Hubbard Model", **S. Nath**, N. S. Mondal and N. K. Ghosh, *Physica B*, **2013**, 412, 83-86 [ISSN 0921-4526; IF: 1.874].
3. "Thermodynamics of the Frustrated 2D Hubbard Model", **S. Nath*** and N.K. Ghosh, *Journal of Superconductivity and Novel Magnetism*, **2014**, 27, 1347-1352 [ISSN 1557-1939; IF: 1.13].
4. "Ground-State Properties of the Frustrated 2D Quarter-Filled Hubbard Model", **S. Nath*** and N. K. Ghosh, *Journal of Superconductivity and Novel Magnetism*, **2014**, 27, 2871-2877 [ISSN 1557-1939; IF: 1.13].



5. "Interplay between Electron-Phonon Interaction and Hubbard Repulsion: An Exact Approach", **S. Nath***, N. S. Mondal and N. K. Ghosh, *Journal of Superconductivity and Novel Magnetism*, June, **2015**, 28, 1687-1692 [ISSN 1557-1939; IF: 1.13].
6. "Phonon-Mediated Electron-Phonon Interaction in Hubbard-Holstein Model", **S. Nath*** and N. K. Ghosh, *Journal of Low Temperature Physics*, January, **2016**, 182, 1-12 [ISSN 0022-2291; IF: 1.491].
7. "Electron-Phonon Interaction in the presence of Strong Coulomb Repulsion", **S. Nath***, N. S. Mondal and N. K. Ghosh, *Journal of Superconductivity and Novel Magnetism*, January, **2018**, 31, 29-35 [ISSN 1557-1939; IF: 1.13].
8. "Relevance of inter-site Coulomb repulsion on high-T_c superconductivity within t-J-V model", P. Pal, K. Roy, **S. Nath*** and N. K. Ghosh, *Chinese Journal of Physics*, March, **2018**, 56, 958-964 [ISSN 0577-9073; IF: 2.544].
9. "Hole pairing and ground state properties of high-T_c superconductivity within the t-t'-J-V model", K. Roy, P. Pal, **S. Nath***, N. K. Ghosh, *The European Physical Journal B*, April, **2018**, 91, 64-1-64-9 [ISSN 1434-6028; IF: 1.44].
10. "Hole-polarons and bipolarons in the Holstein t-J model: Relevance of hole-phonon interaction" K. Roy, **S. Nath*** and N.K. Ghosh, *Physics Letters A*, April, **2019**, 383, 1510-1515 [ISSN 0375-9601; IF: 2.087].
11. "Specific Heat, Entropy and Magnetic Properties of High T_c Superconductivity within the planar t-t'-J-V model" K. Roy, S. Ghosh, **S. Nath*** and N.K. Ghosh, *The European Physical Journal B*, December, **2019**, 92,270 [ISSN 1434-6028; IF: 1.44].
12. "Mobile inter-site bipolarons in presence of long-range interactions" N.S. Mondal and **S. Nath***, *Physica B*, February, **2020**, 578, 411881 [ISSN 0921-4526; IF: 1.874].
13. "The topology and robustness of two Dirac cones in S-graphene: A tight binding approach" A. Bandopadhyay, S. Dutta, D. Jana, **S. Nath** and M. Mohi Uddin, *Scientific Reports*, February, **2020**, 10, 2502 [ISSN 2045-2322; IF: 4.122].
14. **Subhadip Nath**, Arka Bandyopadhyay Sujoy Datta, Md. Mohi Uddin, Debnarayan Jana, "Electronic and optical properties of non-hexagonal Dirac material S-graphene sheet and nanoribbons" *Physica E*, June, **2020**, 120, 114087 [ISSN 1386-9477; IF: 3.382].

15. Niladri Sekhar Mondal , **Subhadip Nath**, Debnarayan Jana and Nanda Kumar Ghosh, “*Band engineering of non-hexagonal 2D tetragonal-silicene sheet and nanoribbons: A theoretical approach*” Journal of Physics and Chemistry of Solids, March, **2021**, 150, 109801[ISSN 0022-3697; IF: 3.995].
16. **Subhadip Nath**, Arka Bandyopadhyay, Sabyasachi Sen, Debnarayan Jana “*First principles investigation of structural, electronic and optical properties of synthesized radiaannulene oligomers for 6,6,12-graphyne*” Journal of Physics and Chemistry of Solids, June, **2021**, 153, 109990 [ISSN 0022-3697; IF: 3.995]
17. Niladri Sekhar Mondal , **Subhadip Nath**, Debnarayan Jana and Nanda Kumar Ghosh, ‘*First-principles study of the optical and thermoelectric properties of tetragonal-silicene*’ Physical Chemistry Chemical Physics, May, **2021**, 23 (20), 11863 – 11875 [ISSN 1463-9076 ; IF: 3.676].
18. **Subhadip Nath** ‘Thermoelectric and optical properties of 2D hexagonal Dirac material Be₃X₂ (X = C, Si, Ge, Sn): A density functional theory study’ Journal of Applied Physics, August, **2021**, 130, 055106 [ISSN 0021-8979; IF: 2.546].
19. Supriya Ghosal, **Subhadip Nath**, Arka Bandyopadhyay, Sabyasachi Sen, and Debnarayan Jana ‘*Tetragonal Silicene and Germanene Quantum Dots: Candidates for Enhanced Nonlinear Optical and Photocatalytic Activity*’ Journal of Physical Chemistry C October, **2021**, 125 , 21718–21728[ISSN 1932-7447; IF: 4.126].
20. Niladri Sekhar Mondal, **Subhadip Nath**, Suman Chowdhury and Debnarayan Jana ‘*Electric field-induced electronic-thermoelectric-optical properties of typical isoelectronic HNC6 monolayers: a theoretical study*’ Applied Surface Science, April, **2022**, 581,152094[ISSN 0169-4332; IF: 6.707].
21. Medha Rakshit, **Subhadip Nath**, Suman Chowdhury, Rajkumar Mondal , Dipali Banerjee and Debnarayan Jana ‘*A study of anisotropic thermoelectric properties of bulk Germanium Sulfide in its Pnma phase: a combined first-principles and machine-learning approach*’ Phys. Scr., October, **2022**, 97 125804 [ISSN 0031-8949; IF: 2.6].

22. Mainak Ghosh, **Subhadip Nath**, Sabyasachi Sen and Debnarayan Jana, '*Nonlinear optical response and characteristic Raman spectra of phagraphene quantum dots*' Phys. Scr., March, **2023**, 98 045109K [ISSN 0031-8949; IF: 2.6]
23. Krishnanshu Basak, **Subhadip Nath**, Rajkumar Mondal, and Debnarayan Jana, '*Electric Field-Induced Phase Transition on HPX6 ($X = C, Si, Ge, Sn$) Monolayers*' Phys. Status Solidi B, June, **2023**, 260, 2300112 [ISSN 0370-1972; IF: 1.6]
24. **Subhadip Nath**, Niladri Sekhar Mondal, Arka Bandyopadhyay, Rajkumar Mondal and Debnarayan Jana '*Non-equivalent nature of acetylenic bonds in typical square graphynes and intricate negative differential resistance characteristics*' J. Phys.: Condens. Matter, May, **2023**, 35, 325501. [ISSN 0953-8984; IF: 2.3]
25. Chumki Tarafdar, Nanda Kumar Ghosh, **Subhadip Nath*** '*Role of inter-site Coulomb interaction on the thermodynamic and ground state properties within the t - J - U - V model*' Physica C: Superconductivity and its applications, November, **2023**, 615 1354393 [ISSN 1873-2143; IF: 1.3]
26. Niladri Sekhar Mondal, Rajkumar Mondal, N Bedamani Singh, **Subhadip Nath***, and Debnarayan Jana, '*Electric field modulated electronic, thermoelectric and transport properties of 2D tetragonal silicene and its nanoribbons*' J. Phys.: Condens. Matter, June, **2024**, 36 385301. [ISSN 0953-8984; IF: 2.3]

B) Conference Proceedings:

1. "Electron phonon interaction in high- T_c superconductors", **S. Nath**, N.S. Mondal, S.K. Bhowmick, and N.K. Ghosh, *Proceedings of the 'International Conference on Recent Trends in Applied Physics and Material Science'*, AIP Conf. Proc., **2013**, 1536, 325-326.
2. "Bipolaron by inter-site electron-phonon interaction", N.S. Mondal, **S. Nath**, S. Bose, and M. Paul, *Proceedings of the '57th DAE Solid State Physics Symposium 2012'*, AIP Conf. Proc., **2013**, 1512, 810-811.
3. "Electron phonon interaction in Hubbard model", **S. Nath**, N.S. Mondal, N.K. Ghosh, and S.K. Bhowmick, *Proceedings of the '57th DAE Solid State Physics Symposium 2012'*, AIP Conf. Proc., **2013**, 1512, 1084-1085.

4. "Ground state properties of the frustrated Hubbard model", **S. Nath**, N.K. Ghosh, S.K. Bhowmick, and N.S. Mondal, *Proceedings of the 'International Conference on Recent Trends in Applied Physics and Material Science'*, AIP Conf. Proc., **2013**, 1536, 1093-1094.
5. "Interplay between Electron-Phonon Interaction and Hubbard Repulsion: Bipolaron Formation", **S. Nath**, N.S. Mondal, and N.K. Ghosh, *Proceedings of the '59th DAE Solid State Physics Symposium 2014'*, AIP Conf. Proc., **2015**, 1665, 090022-1-090022-3.
6. "Superlight Bipolarons in High T_c Superconductors", **S. Nath**, N.S. Mondal, K. Roy and N.K. Ghosh, *Proceedings of the '59th DAE Solid State Physics Symposium 2014'*, AIP Conf. Proc., **2015**, 1665, 130031-1-130031-3.
7. "Small Superlight Bipolarons within $t-J_p$ model", K. Roy, **S. Nath** and N.K. Ghosh, *Proceedings of the 'International Conference on Condensed Matter and Applied Physics (ICC 2015)'*, AIP Conf. Proc., **2016**, 1728, 020019-1-020019-4.
8. "Interplay between on-site electron-phonon interaction and inter-site Coulomb repulsion", **S. Nath**, N.S. Mondal, K. Roy and N.K. Ghosh, *Proceedings of the '60th DAE Solid State Physics Symposium 2015'*, AIP Conf. Proc., **2016**, 1731, 090032-1-090032-3.
9. "High- T_c Superconductivity: The t - J - V Model and its Applications", K. Roy, P. Pal, **S. Nath** and N.K. Ghosh, *Proceedings of the '60th DAE Solid State Physics Symposium 2015'*, AIP Conf. Proc., **2016**, 1832, 130024-1-130024-3.
10. "Hole Pairing and Thermodynamic Properties of the Two Dimensional Frustrated t - J model", K. Roy, P. Pal, **S. Nath** and N.K. Ghosh, *Proceedings of the '62nd DAE Solid State Physics Symposium 2017'*, AIP Conf. Proc., **2018**, 1942, 130012-1-130012-3.
11. "On some ground state characteristics of the t - J - V model", P. Pal, K. Roy, **S. Nath** and N.K. Ghosh, *Proceedings of '2nd International Conference on Condensed Matter and Applied Physics (ICC 2017)'*, AIP Conference Proceedings, **2018**, 1953, 120003-1-120003-4.

13. Membership of Learned Societies/ Editorial Boards, etc.: Reviewer of Scientific Reports, New Journal of Physics, etc,

14. Patents: Nil

15. Awards: CSIR-NET (thrice), Gate 2009

16. Other notable activities:

17. A) Participation in Seminars/Symposia/Conferences/Workshops:

1. **Presented a paper** entitled "*Numerical studies on High Temperature Superconductors using Hubbard Model*" in the **National Conference 'Condensed Matter Days 2010'**, organized by Department of Physics, University of Kalyani from **25th-27th August, 2010**.
2. **Presented a paper** entitled "*Thermodynamic properties of the 2D extended Hubbard model*" in the **National Conference 'Condensed Matter Days 2011'**, organized by Department of Physics, Gauhati University from **24th-26th August, 2011**.
3. **Participated** in the **International level '56th DAE- Solid State Physics Symposium'**, organized by SRM University, Kattankulathur, Tamil Nadu on 19th-23rd December, 2011.
4. **Presented a paper** entitled "*Pairing Susceptibility and Hole dynamics in the extended 2D Hubbard model*" in the UGC sponsored Second **National Seminar** on '*Recent Trends in Condensed Matter Physics including Laser Applications (SNSCMPLA-2012)*', organized by Department of Physics, University of Burdwan on **22-23rd March, 2012**.
5. **Presented a paper** entitled "*Electron phonon interaction in Hubbard model*" in the **International level '57th DAE- Solid State Physics Symposium'**, organized by Indian Institute of Technology, Bombay, Mumbai on 3rd-7th December, 2012.
6. **Presented a paper** entitled "*Ground state properties of the frustrated Hubbard model*" in the '*International Conference on Recent Trends In Applied Physics and Material Science RAM-2013* ', organized by Govt. College of Engineering and Technology, Bikaner on 1st-2nd February, 2013
7. **Presented a paper** entitled "*Interplay between Electron-Phonon Interaction and Hubbard Repulsion: Bipolaron Formation*" in the **International level '59th DAE- Solid State Physics Symposium'**, organized by VIT University, Vellore on 16th -20th December, 2014.
8. **Presented a paper** entitled "*High- T_c Superconductivity: The t - J - V Model and its Applications*" in the **International level '60th DAE- Solid State Physics Symposium'**, organized AMITY University UP, Noida on 21st-25th December, 2015.
9. **Presented a paper (Oral presentation)** entitled "*Electron-Phonon Interaction in Presence of Inter-site Coulomb Repulsion*" in the **National Conference** on '*Emerging Trends in Condensed Matter Physics and Material*

Science', organized by Department of Physics, University of Kalyani on **18-19th March, 2016**.

10. **Presented a paper** entitled "*Interplay Between Inter-site Electron-Phonon Interaction and Inter-site Coulomb Repulsion*" in the **National Seminar** on '*Recent Trends in Condensed Matter Physics including Laser Applications (NSCMPLA-2017)*', organized by Department of Physics, University of Burdwan on **8-9th March, 2017**.
11. **Presented a paper** entitled "*Electronic Structure of S-Graphene sheet and Nanoribbon*" in the **National Seminar** '*Condensed Matter Days 2018 (CMDAYS-2018)*' organized by Department of Physics, University of Burdwan on **29th to 31st August, 2018**
12. **Presented a paper** entitled "*Electronic and Optical Properties of S-Graphene Sheet and Nanoribbon*" in the **National Seminar** '*National Conference on Recent Developments in nanoscience and Nanotechnology (NCRDNN)*' organized by School of materials Science and Nanotechnology, Jadavpur University on **29th to 31st January, 2019**
13. **Presented a paper (Oral presentation)** entitled "*Ab initio study of the electronic, optical and thermal properties of non-hexagonal Dirac material S-Graphene sheet*" in the **National Seminar** '*Condensed Matter Days 2019 (CMDAYS-2019)*' organized by Department of Physics, Vidyasagar University, Midnapore on **29th to 31st August, 2019**

B) Participation in OP/RC:

- Participated in the UGC sponsored **Orientation Programme** (OP-119) organized by the UGC-HRDC, University of Calcutta from **17th July to 12th August, 2017**.
- Participated in the UGC sponsored **3rd Refresher course on Nano-science and Nano-technology** organized by the UGC-HRDC, University of Burdwan from **14th September to 4th October, 2018**
- Participated in the UGC sponsored **Refresher course on Physics** organized by the UGC-HRDC, University of Calcutta from **15th February-28th February, 2022**

