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Research Area:	Liquid Crystals, Nanomaterials, Carbon Nanospheres from Biowaste, Photoalignment Materials, Biosensors, Supercapacitors, Display Technology
Publications (Past 5 years)	1. Anvitha Murari, Arathi A, Uraiwan Sirimahachai, Srilatha Rao and Gurumurthy Hegde, "Corrosion Inhibition of Mild Steel Using Eco-Friendly Porous Nanocarbon Derived from Waste Mango Kernels: A Step Towards Sustainability", RSC Advances, https://pubs.rsc.org/en/content/authorreprints 2. Kiran Bijapur, Gurumurthy Hegde, "Nanotechnology in the Food Industry", CRC Press, Nanotechnology for Food Security and Quality Assurance, 2026. DOI: 10.1201/9781003630630-1 3. Garima Shukla, Ayushi Rastogi, Supriya Spunjalkatte, Gurumurthy Hegde, Rajiv Manohar, "Photoaligned nematic liquid crystals doped with palladium immobilised Carbon nanospheres for advanced low voltage display and energy storage devices", Journal of Materials Chemistry C, 2026. DOI: 10.1039/D5TC04092B 4. B Sirichandana, Jyothi MS, Swarnalata Swain, Gurumurthy Hegde, "Biomass-derived Carbonaceous Materials for Electrocatalysis: A Review", Journal of The Electrochemical Society, 2026. 5. Swarnalata Swain, B Sirichandana, Prangya Bhol, K S Anantharaju, Gurumurthy Hegde, "2D bifunctional materials: unlocking innovations for efficient water splitting", Sustainable Energy & Fuels, 2026. DOI: 10.1039/D5SE00080G 6. Kari K.V., Soman G., Angadi V.J., Hegde G., Basavegowda N., Ganesh V. and Algarni H., "Structure-Tuned Pr-Doped NiFe2O4 Nanoceramics for Enhanced Pseudocapacitive Performance: Insights from Lattice Distortion and Charge Transfer Dynamics", Ceramics International, 2025. DOI: 10.1016/j.ceramint.2025.09.132 7. Aman Sharma, Vandana Molahalli, Gurumurthy Hegde, "Harnessing Biomass into Advanced Carbon Materials for Dye Degradation", Environmental Chemistry and Safety, 2025. DOI: 10.26599/ECS.2025.9600017 8. Bhat V.S., Shivanna J.M., Shetty A., Molahalli V., Krishnan S.G., Sahoo S., Pai R.K., Aminabhavi T.M. and Hegde G., "Flexible Supercapacitors and Solid-State Electrolytes: A Perspective on the Key to Flexibility", Energy & Fuels, 2025. DOI: 10.1021/acs.energyfuels.5c00973 9. Ashwini M.A., Suresh Sagadevan, BG Maya Patel, Gurumurthy Hegde et al., "Facile synthesis of novel ternary g-C_3N_4/MnO_2/CQDs nanocomposite for efficient photocatalytic degradation of methylene blue and DFT study", Surfaces and Interfaces, 2025. DOI: 10.1016/j.surfin.2025.107369 10. Suvadra Das, Dipanjan Sengupta, Vandana Molahalli, Partha Roy, Gurumurthy Hegde, "Porous Carbon Nanospheres Derived From Caesalpinia Sappan Pods as Novel Antibacterial Agents", ChemNanoMat, 2025. DOI: 10.1002/cnma.202500204 11. Ashwini M.A., Suresh Sagadevan, BG Maya Patel, Gurumurthy Hegde et al., "Biosynthesized carbon quantum dots/g-C3N4/Co3O4 composites for effective methylene blue dye degradation and DFT study", Diamond and Related Materials, 2025. DOI: 10.1016/j.diamond.2025.112628 12. Phanindra D.V.S., L.S. Greeshma, Della Vincent, Muhammed Raees, K. Nagaraju, Gurumurthy Hegde, P. Sreekumar, and Manoj AG Namboothiry, "Fabrication of

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	properties of porous carbon nanoparticles derived from biomass", Journal of Nanostructure in Chemistry, 2021. DOI: 10.1007/s40097-021-00427-4 74. Anila Rose Cherian, Libina Benny, Ashlay George, Anitha Varghese, Gurumurthy Hegde, "Recent advances in the functionalization and heteroatom doping of carbon nano surface structures for electrochemical sensing applications: Tuning and turning", Journal of Nanostructure in Chemistry, 2021. DOI: 10.1007/s40097-021-00426-5 75. Shanker G, Gurumurthy Hegde, Shruthi S, Michal Smahel, Michal Kohout, "Influence of Linking Units on the Photo Responsive Studies of Azobenzene Liquid Crystals: Application in Optical Storage Devices", Journal of Molecular Liquids, 2021. DOI: 10.1016/j.molliq.2021.116744 76. Gurumurthy Hegde, S K Prasad, Pragnya Satapathy, Raghavendra Adiga, Monish Kumar, "Porous nanocarbon particles drive large magnitude and fast photomechanical actuators", Journal of Nanostructure in Chemistry, 2021. DOI: 10.1007/s40097-021-00414-9 77. Gurumurthy Hegde et al., "Liquid Crystals: Synthesis, Characterization and its Applications", Current Organic Synthesis, 2021. DOI: 10.2174/1570179418042106071538 32 78. Yit-Peng Goh, Wan-Sinn Yam, Foo-Win Yip, Gurumurthy Hegde, "Chiral Polymorphic Hydrazine-based Asymmetric Liquid Crystal Trimers with Resorcinol as Linking Group", Current Organic Synthesis, 2021. DOI: 10.2174/1570179418666210202123935 79. Andriy Kozachenko, Lachezar Komitov, Gurumurthy Hegde, "Generation of Hidden Bistable Images in a Cholesteric Liquid Crystal Device", Journal, 2021. 80. Mahmoud Nasrollahzadeh, Reza Akbari, Solmaz Sakhaei, Zahra Nezafat, Saeed Banazadeh, Yasin Orooji, Gurumurthy Hegde, "Polymer supported copper complexes/nanoparticles for treatment of environmental contaminants", Journal of Molecular Liquids, 2021. DOI: 10.1016/j.molliq.2021.115668 81. Vinay S. Bhat, Syam G. Krishnan, Titilope John Jayeoye, Thitima Rujiralai, Uraiwan Sirimahachai, R. Viswanatha, Mohammad Khalid, and Gurumurthy Hegde, "Self-activated 'green' carbon nanoparticles for symmetric solid-state supercapacitors", Journal of Materials Science, 2021. DOI: 10.1007/s10853-021-06154-z 82. Libina Benny, Anjali John, Anitha Varghese, Gurumurthy Hegde, Louis George, "Waste Elimination to Porous Carbonaceous Materials for the Application of Electrochemical Sensors: Recent Developments", Journal of Cleaner Production, 2020. DOI: 10.1016/j.jclepro.2020.125759 83. Rastogi A., Pandey F.P., Parmar A.S., Singh S., Hegde G., Manohar R., "Effect of carbonaceous oil palm leaf quantum dot dispersion in nematic liquid crystal on zeta potential, optical texture and dielectric properties", Journal of Nanostructure in Chemistry, 2020. DOI: 10.1007/s40097-020-00382-6 84. John A., Benny L., Cherian A.R., Narahari S.Y., Varghese A., Hegde G., "Electrochemical sensors using conducting polymer/noble metal nanoparticle nanocomposites for the detection of various analytes: a review", Journal of Nanostructure in Chemistry, 2020. DOI: 10.1007/s40097-020-00372-8 85. Kanagavalli Pandiyaraj, Gaurav R. Pandey, Vinay S. Bhat, Murugan Veerapandian, and Gurumurthy Hegde, "Nitrogenated-carbon nanoelectrocatalyst advertently processed from bio-waste of Allium sativum for oxygen reduction reaction", Journal of Nanostructure in Chemistry, 2020. DOI: 10.1007/s40097-020-00370-w 86. Mathew Agnus T., S. Supriya, K.B. Akshaya, Anitha Varghese, and Gurumurthy Hegde, "An aqueous phase TEMPO mediated electrooxidation of 2-thiophenemethanol using MnO2-Pi dispersed nanocarbon spheres on a carbon fiber paper electrode", RSC Advances, 11(4), 2000-2009, 2021. DOI: 10.1039/d0ra09488a 87. Gomaa AM Ali, S Supriya, Kwok Feng Chong, Essam R Shaaban, H Algarni, T Maiyalagan, Gurumurthy Hegde, "Superior supercapacitance behavior of oxygen self-doped carbon nanospheres: a conversion of Allium cepa peel to energy storage system", Biomass Conversion and Biorefinery, 2020. DOI: 10.1007/s13399-019-00520-3
Sponsored Projects (Past and Ongoing)	**Project Title :** Synthesis of Carbon Nanospheres from Biowaste for Energy Storage and Environmental Applications **Sponsor :** DST-Nanomission, Govt of India **Awardee :** Dr. Gurumurthy Hegde

	Scheme : DST-Nanomission Grant, USD 1,15,000, 2018-2021 **Project Title :** Advanced Nanomaterials for Industrial Applications **Sponsor** : VGST-Govt of Karnataka **Awardee** : Dr. Gurumurthy Hegde **Scheme** : VGST Grant, USD 25,000, 2023-2026 (Ongoing) **Project Title :** Biowaste-based Products for Consumer Applications **Sponsor** : MSME-Govt of India **Awardee** : Dr. Gurumurthy Hegde **Scheme** : MSME Grant, USD 50,000, 2023-2024 **Project Title :** Nanoscale Alignment of Liquid Crystals Using Light as a Tool for Display Technology **Sponsor** : DST-SERB, Govt of India **Awardee** : Dr. Gurumurthy Hegde **Scheme** : DST-SERB Young Career Award, USD 65,000, 2016-2019 **Total Grants: 21 projects, ~USD 4.5 million (India, Malaysia, Sweden, Hong Kong, Japan)**
Profile Links : Scopus and Orcid	Google Scholar: https://scholar.google.com/citations?user=j_k2cRMAAAAJ **Scopus ID :** 24175984300 **Orcid :** 0000-0002-1200-5664 **h-Index :** 51 **Citations :** More than ~7700 **Total ISI/Scopus Papers Published :** ~330 **Total Patents :** 28 (6 Granted: 1 USA, 5 India) **Top 2% Stanford Scientist List (2020-2025)**

Research Activities (Write about your best research results max of 2-3 pages including diagrams)	I am working on liquid crystal photoalignment technology, synthesis and applications of carbon nanospheres from biowaste, and development of biosensors and energy storage devices. I am also the Founding Director of Adindistech Pvt Ltd, a start-up company incubated at CHRIST University, Bengaluru. The summary of research undertaken can be described as: ➤ **Liquid Crystal Photoalignment Technology :** Using light-sensitive azo-dye materials, new alignment techniques for ferroelectric and nematic liquid crystals have been developed with direct applications in fast-switching displays and electronic paper technology. Periodic anchoring conditions for short-pitch cholesteric liquid crystals in uniform lying helix (ULH) texture were established, enabling a new generation of ultra-fast liquid crystal light shutters. Photoalignment studies on bishydrazone and thiophene-based acrylate materials demonstrated excellent photostability and alignment quality. The vertical alignment (VA) materials developed showed superior performance compared to conventional rubbing-based methods. These results have been published in Applied Physics Letters, Journal of Physics D, and Journal of the SID, with significant industry interest from Nissan Chemicals and Di-Nippon Ink Company. ➤ **Carbon Nanospheres from Biowaste :** Porous carbon nanospheres (CNS) have been synthesized from agricultural biowaste materials including palm oil leaves, sago bark, and sandalwood. These CNS materials have been applied as: (i) supercapacitor electrodes with excellent charge storage capacity, (ii) wastewater treatment adsorbents for removal of heavy metals and organic dyes, and (iii) antimicrobial agents. The 'Waste-to-Wealth' approach has yielded 8 patents filed in India and Malaysia, and has received the ELSEVIER Emerging Investigator Award (2017) and multiple gold medals at international invention exhibitions (INPEX Pittsburgh 2014, ITEX Malaysia 2015, SIIF Seoul 2013). Two products are now under commercial domain through Adindistech Pvt Ltd.

	➤ **Entrepreneurship and Technology Commercialization :** As Founding Director of Adindistech Pvt Ltd (incubated at CHRIST University, Bengaluru), two products have been released to the market: Nanomaterials and Photoaligning Materials. The company has signed 5 MoUs, 1 MoA, and 3 NDAs with industry partners. A pre-commercialization fund has been secured. Total research grants obtained span 21 projects worth ~USD 4.5 million across India, Malaysia, Sweden, Hong Kong, and Japan. This entrepreneurial activity has been recognized with the Sir CV Raman Young Scientist Award (2017, Govt of Karnataka), DST-SERB Young Career Award (2017), Innovator Award (2023, Govt of Karnataka), and listing in the Stanford Top 2% Scientists list (2020-2025).

Collaborations	Prof. Lachezar Komitov, Gothenburg University, Sweden. Prof. V.G. Chigrinov, HKUST, Hong Kong. Prof. Mashitah M. Yusoff, Universiti Malaysia Pahang (UMP), Malaysia. Prof. S. Krishna Prasad, JNCASR / CeNS, Bengaluru, India. Prof. Arun M. Isloor, NIT Surathkal, Mangalore, India. Prof. Henry T. Wong, Institute of Physics, Academia Sinica, Taipei. Dr. Md. Lutfor Rahman, Universiti Malaysia Pahang, Malaysia. Dr. Manoj Kumar Singh, Institute of Physics, Academia Sinica, Taipei. Prof. Katalin Fodor-Csorba, Wigner Research Centre, Hungary. Dr. Omaima Elamain, Gothenburg University, Sweden. Dr. Rasha Ata Alla, Gothenburg University, Sweden. Dr. Vivek Sharma, HNB Garhwal University, Srinagar, Uttarakhand.
Invited Talks	1. Plenary Talk: "Higher Educational Institutions in India", ISAS-2026, Belagavi, 2026. 2. Keynote: "Biowaste to innovative applications", Buddhadev College of Engineering, 2021. 3. Keynote: "Waste to Wealth Technologies", ICONIET International Conference, Jakarta, Indonesia, 2019. 4. Keynote: "Biowaste materials and their innovative applications", Emerging Nano-materials Conference, Thailand, 2018. 5. S.K. Memorial Lecture: "Innovative applications of light", International Conference on Surface Engineering, IISc Auditorium, Bengaluru, 2018. 6. Keynote: "Biowaste based Carbon Nanospheres and Applications", IC-STAR 2016, Bandar Lampung, Indonesia, 2016. 7. Keynote: "The effects of environmental pollution and sunlight on skin", ADC Programme, Seoul, South Korea, 2016. 8. Invited: "Nanoscale surface aligning using light as a tool for electronic paper displays", ICNM-2017, MG University, Kottayam, 2017. 9. Invited: "Super Capacitors using Biowaste Carbon Nanospheres", ICSEM-2016, RV College of Engineering, Bengaluru, 2016. 10. Invited: "Fast Switching Liquid Crystal Display Modes", SPIE, San Francisco, USA, 2012. 11. Keynote: "Nanostructured shape anisotropic materials for LCD applications", ICSMMS 2014, Hangzhou, China, 2014. 12. Invited: "Photoalignment of Liquid Crystals: Properties and Applications", ICRAMST, NIT Surathkal, 2013. (Total: 58 oral/keynote/invited/plenary presentations at national and international conferences)
Group Members (PhD Students and Projects) Open Positions: If any	**Completed PhD Students:** Mr Kiran B – Awarded PhD, 2025 Mr Aman Sharma – Awarded PhD, 2025 Ms Gowri S – Awarded PhD, 2025 Ms Bhavya K – Completed PhD, 2023 Mr Vinay Bhat – Completed PhD, 2023 Ms Supriya S – Completed PhD, 2020 Ms Divyashree A – Completed PhD, 2021 Ms Roopa Gaonkar – Completed PhD, 2018

	Omaima Elamain – Awarded PhD 2013, Gothenburg University, Sweden (Main supervisor) Rasha Ata Alla – Awarded PhD 2013, Gothenburg University, Sweden (Co-supervisor) Yuvraj S – PhD UMP Malaysia (Main supervisor), Submitted 2015 Mehdi Qasim – PhD UMP Malaysia (Main supervisor), Submitted 2014 **Ongoing PhD Students:** Apoorva Shetty – PhD on Catalysis (Submitted) Sirichandana B – PhD on Electrocatalysis Maya Patel – PhD on Membranes Anvitha M – PhD on Electrochemical Corrosion Sunil B N – PhD on Photoinduced Studies Open Positions: Positions available for motivated PhD students in nanomaterials and energy storage. Contact: gurumurthy-phy@dsu.edu.in