Dr. Akash M. Chandran

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Research Profile

My research focuses on material science and engineering. Specifically, I am engaged in fabricating and characterizing polymer nanocomposites for a wide range of applications, including flexible sensors, piezo-tribo nanogenerators, wearable electronics, and water treatment. Additionally, the main focus of my research is the synthesis of nanoparticles with various physical characteristics, followed by functionalization to enhance their optical and surface properties. One of the primaries focuses of my study is the development of novel materials to facilitate technology transfer.

Research interest

Polymer synthesis, Polymer composite, Hydrogen generation, Smart textile, Flexible electronic, Self-powered E-Skin

Academia

National Institute of Technology Calicut — Kerala, India
Ph. D. in Chemical Engineering — *2024*
Specializing in Material Science and Polymer Technology

Government Engineering College Thrissur — Kerala, India
M. Tech. in Chemical Engineering — *2017*

Government Engineering College Thrissur — Kerala, India
B. Tech. in Chemical Engineering — *2014*

Publications

Journals

1. M. Chandran, S. Varun, and P. K. S. Mural, "**Development of self-poled PVDF/MWNT flexible nanocomposites with a boosted electroactive β-phase**," New Journal of Chemistry, vol. 44, no. 34, pp. 14578–14591, 2020, https://doi.org/10.1039/D0NJ02003f
2. M. Chandran, S. Varun, and P. K. S. Mural, "**Flexible electroactive PVDF/ZnO nanocomposite with high output power and current density**," Polymer Engineering & Science, vol. 61, no. 6, pp. 1829–1841, 2021, https://doi.org/10.1002/pen.25704

3. **M. Chandran** and P. K. S. Mural, "**Surface silanized MWCNTs doped PVDF nanocomposite with self-organized dipoles: an intrinsic study on the dielectric, piezoelectric, ferroelectric, and energy harvesting phenomenology**," Sustainable Energy & Fuels, vol. 6, no. 6, pp. 1641–1653, 2022, https://doi.org/10.1039/D1SE01256H
4. **M. Chandran**, S. Varun, S. C. Karumuthil, S. Varghese, and P. K. S. Mural, "**Zinc Oxide Nanoparticles Coated with (3-Aminopropyl) triethoxysilane as Additives for Boosting the Dielectric, Ferroelectric, and Piezoelectric Properties of Poly(vinylidene fluoride) Films for Energy Harvesting,**" ACS Applied Nano Materials, vol. 4, no. 2, pp. 1798–1809, Feb. 2021, https://doi.org/10.1021/acsanm.0c03214
5. **M. Chandran**, E. Tayal, and P. K. S. Mural, "**Polycaprolactone-blended cellulose acetate thin-film composite membrane for dairy waste treatment using forward osmosis**," Environmental Science and Pollution Research, vol. 29, no. 57, pp. 86418–86426, Dec. 2022, https://doi.org/10.1007/s11356-022-20813-x
6. **M. Chandran**, S. Varun, and P. K. S. Mural, "**Comparative study on thermal and electrical transport properties of hexagonal boron nitride and reduced graphene oxide/epoxy nanocomposite by transient plane source techniques and impedance spectroscopy,**" Journal of Materials Science: Materials in Electronics, vol. 32, no. 20, pp. 25350–25362, Oct. 2021, https://doi.org/10.1007/s10854-021-06994-0
7. J. P. Varghese, **A. M. Chandran**, P. K. S. Mural, R. Sunitha, and P. Preetha, "**Investigating the Characteristics of Amino Silane Functionalized Alumina Nanoparticles Doped Epoxy Nanocomposite for High-Voltage Insulation,**" IEEE Transactions on Nanotechnology, vol. 21, pp. 227–235, 2022, https://doi.org/10.1109/TNANO.2022.3172546
8. S. Varun, N. M. George, **A. M. Chandran**, L. A. Varghese, and P. K. S. Mural, "**Multifaceted PVDF nanofibers in energy, water and sensors: A contemporary review (2018 to 2022) and future perspective,**" Journal of Fluorine Chemistry, vol. 265, p. 110064, Jan. 2023, https://doi.org/10.1016/j.jfluchem.2022.110064
9. K. Juraij, V. H. Shafeeq, **A. M. Chandran**, S. Vasudevan, P. K. S. Mural, and A. Sujith, "**Human body stimuli-responsive flexible polyurethane electrospun composite fibers-based piezoelectric nanogenerators**," Journal of Materials Science, vol. 58, no. 1, pp. 317–336, Jan. 2023, https://doi.org/10.1007/s10853-022-08086-8
10. Shyju S., **A. M. Chandran**, S. Varun, M. V. P. Kumar and P. K. S. Mural, "**Polyethylenimine functionalized graphene oxide-doped chitosan nanocomposite-based triboelectric nanogenerators for energy scavenging,"** ACS Applied Electronic Materials, 2024, https://pubs.acs.org/doi/10.1021/acsaelm.3c01428
11. Varun, S., **Akash M. Chandran**, K. P. Minhaj, Vishnu Shaju, Lity Alen Varghese, and Prasanna Kumar S. Mural. "**Unveiling predictive insights for enhanced performance of PVDF-based nanogenerators via machine learning modeling**." Chemical Engineering Journal (2024): 149661. https://doi.org/10.1016/j.cej.2024.149661
12. Vanisree, G. S., **Akash M. Chandran**, and K. Aparna. "**Investigation on thermochemical characteristics and pyrolysis kinetics of lignocellulosic biomass for biofuel production feasibility**." Biomass Conversion and Biorefinery (2024): 1-19. https://doi.org/10.1007/s13399-024-05657-4
13. Bhat, Asrar Rafiq, Shewli Pratihar, Sehreen Manzoor, **Akash M. Chandran**, Aswani Yella, and Prasanna Kumar S. Mural. "**Augmenting Piezoelectric Performance of Poly (vinylidene fluoride) Nanogenerator with Zinc Oxide Nanorods Decorated Reduced Graphene Oxide Nanosheets**." ACS Applied Nano Materials (2024). https://doi.org/10.1021/acsanm.4c00732
14. S Pratihar, AM Chandran, AR Bhat, PKS Mural. "**Piezoelectric Nanogenerators Based on Poly (vinylidene fluoride) Doped with High Entropy Oxide Nanoparticles for Sensitive Pressure Sensors**." ACS Applied Nano Materials (2024). https://pubs.acs.org/doi/full/10.1021/acsanm.4c03569

Conferences Publication

1. **M. Chandran**, S. Varun, and P. K. S. Mural, "**Fabrication of novel nanogenerator from PVDF nanocomposites encompassing hybrid silanized MWCNTs**," AIP Conference Proceedings, vol. 2289, no. 1, p. 020016, Nov. 2020, https://doi.org/10.1063/5.0028262
2. **M. Chandran**, S. Varun, and P. K. S. Mural, "**h-BN and graphene oxide/epoxy nanocomposite – A comparative study of mechanical, electrical and thermal properties**," AIP Conference Proceedings, vol. 2289, no. 1, p. 020016, Nov. 2020, https://doi.org/10.1063/5.0028259
3. S. Celine, S. Varun, **A. M. Chandran**, and P. K. S. Mural, "**Electrospun PVDF/silica thiol nanofiber for chromium exclusion**," Materials Today: Proceedings, vol. 47, pp. 1461–1465, Jan. 2021, https://doi.org/10.1016/j.matpr.2021.03.689

Conferences Attended

1. **Akash M Chandran**, Varun S, Ann Mary Paul, Aquib Mohammed and Dr. Prasanna Kumar S Mural, **Surface energized inherent piezo ceramic $BaTiO_3$ doped PVDF film for nanogenerator**, presented at 11th International Conference on Advancements in Polymeric Materials, APM 2020, held during February 13 - 15, 2020 at Bengaluru.
2. **Akash M Chandran** and Dr. Prasanna Kumar S Mural, **Polycaprolactone Blended Cellulose Acetate Thin Film Composite Membrane for Dairy Waste Treatment using Forward Osmosis**, Presented at the International Conference on Advances in Chemical and Environmental Engineering, ACEE 2021, during December 16-17, 2021 (Online)

Book Chapters

1. **M. Chandran**, S. Varun, L. A. Varghese, and P. K. S. Mural, "**4 - Fabrication and processing methods of fluoropolymer nanocomposite**s," in Advanced Fluoropolymer Nanocomposites, K. Deshmukh and C. M. Hussain, Eds., in Woodhead Publishing Series in Composites Science and Engineering. Woodhead Publishing, 2023, pp. 121–153. https://doi.org/10.1016/B978-0-323-95335-1.00021-9
2. **M. Chandran**, S. Varun, L. A. Varghese, and P. K. S. Mural, "**6 - Electrical and thermal conductivity studies of fluoropolymer nanocomposites,**" in Advanced Fluoropolymer Nanocomposites, K. Deshmukh and C. M. Hussain, Eds., in Woodhead Publishing Series in Composites Science and Engineering. Woodhead Publishing, 2023, pp. 181–211. https://doi.org/10.1016/B978-0-323-95335-1.00017-7
3. S. Varun, R. Yerolla**, A. M. Chandran**, C. S. Besta, L. A. Varghese, and P. K. S. Mural, "**22 - Molecular dynamics simulations and theoretical modeling studies of fluoropolymer nanocomposites,**" in Advanced Fluoropolymer Nanocomposites, K. Deshmukh and C. M. Hussain, Eds., in Woodhead Publishing Series in Composites Science and Engineering. Woodhead Publishing, 2023, pp. 787–807. https://doi.org/10.1016/B978-0-323-95335-1.00003-7
4. M. A. Mural Aquib Mohammed, **Akash M. Chandran**, S. Varun, Prasanna Kumar S., "**Applications of Electrospun Membranes for Wastewater Treatment**," in Sustainable Technologies for Water and Wastewater Treatment, CRC Press, 2021. Available: https://doi.org/10.1201/9781003052234-8
5. Ekta Tayal, **Akash M. Chandran**, S. Varun, Reshma Lakra, Prasanna Kumar S. Mural, Subhankar Basu. "**Application of Forward osmosis (FO) as Bio-membrane filtration technique**" In Biological treatment of mixed industrial wastewater with a bioreactor approach (*accepted*)

Patents-Granted

Varun S., **Chandran A.M.**, Mural P.K.S. **Design of Low-Cost, Highly Sophisticated Piezo, Tribo, Piezo-Tribo Hybrid Electric Characterization Instrument**. Indian Patent, Application no. 202141050973 (2021)

Any other information

1. **Akash M Chandran**, Varun S, Ann Mary Paul, Aquib Mohammed and Dr. Prasanna Kumar S Mural, **Surface energized inherent piezo ceramic $BaTiO_3$ doped PVDF film for nanogenerator**, presented at 11th International Conference on Advancements in Polymeric Materials, APM 2020, held during February 13 - 15, 2020 at Bengaluru.
2. Varun, S., **Chandran, A. M.**, Mohan, A. & Mural, P. K. S. (2020). **One-pot fabrication of piezo-electric PVDF with modified carbonaceous nanoparticles for energy harvesting**, attended at 11th International Conference on Advancements in Polymeric Materials, APM 2020, held during February 13 - 15, 2020 at Bengaluru.
3. Ekta Tayal, Akash M Chandran, Prasanna Kumar S Mural, **A comparative study of cellulose acetate/polycaprolactone blend electrospun and phase-inversion membranes for forward osmosis**, presented and attended at Yukthi-2021 The International Conference on Emerging Trends in Engineering held from 23rd to 25th July 2021 at GEC Kozhikode, Kerala, India.
4. Ann Rose, Fasnabi PA, Prasanna Kumar S Mural, **Akash M Chandran**, **A Carbon Doped Electrospun Nano Fibre for Effective Emi Shielding**, attended at Yukthi-2021 The International Conference on Emerging Trends in Engineering.
5. **Akash M Chandran** and Dr. Prasanna Kumar S Mural, **Polycaprolactone Blended Cellulose Acetate Thin Film Composite Membrane for Dairy Waste Treatment using Forward Osmosis**, Presented at the International Conference on Advances in Chemical and Environmental Engineering, ACEE 2021, during December 16-17, 2021 (Online).
6. Actively participated and served as a member of the organizing committee for the **GIAN Course 'Tailored Polymeric Membranes for Bio-separations and Biomedical Applications**,' held from 26th to 30th September 2022 at Department of Chemical Engineering, National Institute of Technology Calicut, Kerala, India, featuring Prof. Ranil Wickramasinghe from the University of Arkansas, USA, as the foreign expert.
7. Participated and contributed as a member of the organizing committee for the **'International Conference: Sustainable Technologies in Water Treatment and Desalination (STWTD – 2020)**,' held on 10th–12th December 2020 and 28th–29th January 2022 at Department of Chemical Engineering, National Institute of Technology Calicut, Kerala, India.
8. Participated and served as a member of the organizing committee for the Faculty Development Program (FDP) **'Novel Perspective in Technologies for Micro-Pollutant Removal from Aqueous System (NPTMRAS 2020)**,' sponsored by **TEQIP-III**, held from 20th to 25th January 2020 at the Department of Chemical Engineering, National Institute of Technology Calicut, Kerala, India.
9. Participated in the six-day TEQIP-III sponsored Faculty Development Program (FDP) on **'Recent Innovations and Developments in Electrochemical and Chemical Process Optimization (RIDECPO-2019)**,' conducted from 17th to 22nd June 2019 at NIT Calicut.
10. Served as a member of the organizing committee for the **'International Conference on Green Energy and Environmental Sustainability (ICGEES 2020)**,' held from 5th to 6th August 2020 at Department of Chemical Engineering, National Institute of Technology Calicut, Kerala, India.