

Dr. M. Vijay Kumar, MSc, MTech, PhD

Research Specialist, University of Illinois, Chicago, USA

✉ vijaykum@uic.edu ✉ mvkumar198525@gmail.com

🌐 <https://mvku.github.io/Dr.-Vijay-Kumar/>

🌐 <https://www.linkedin.com/in/dr-vijay-kumar-39256160/>

📞 +1-3124784943 📞 +91-9600476382




Research

- Future Directions** 📌 Optical Engineering (Optical manipulation, tweezing, levitation, switching), Electro-Opto-Magneto-Thermo field tunable grating and Diffractive Optics, Electro-Optical switching, Modulators, devices and Sensors, Soft-Photonics, Non-linear optics in Liquid Crystals, Laser induced fluorescence Particle Image velocimetry, Laser assisted pyro-electricity in Liquid crystals, Nano-Photonics in softmatter, Artificial Intelligence and Machine Learning on soft matter physics. IoT devices (Internet of things) and sensors in microfluidics for smart bio-applications.
- Current Interest** 📌 Laser Induced Fluorescence μ -Particle Image Velocimetry in microfluidics Channels Fluid dynamics (Laminar, Elastic Instability, Drag enhancement, Drag reduction, Elastic Turbulence, non-Newtonian fluid), Particle dynamics (particle spinning, tumbling in shear flow of Newtonian fluid (Microfluidics), Liquid Crystals (physical characterization of nematic, Smectic A, Smectic C*, ferroelectric liquid crystals, topological defects, chiral-achiral molecules), phase transition in soft matter (self-assemblies of liquid crystals molecules, plastic crystals, polymers and gels), nano-colloids/nanoparticles, nano-scale confinement study.
- Techniques** 📌 Optical manipulations, Optical Switching, Electro optical switching, Optical Tweezing, Optical Levitation, Particle Image Velocimetry (μ -PIV), Particle Tracking Velocimetry (μ -PTV), Image processing, Microfluidics device fabrications, soft lithography, etching, PDMS devices, polarizing optical microscopy, X-ray, dielectric spectroscopy and calorimetric studies on Liquid Crystals. Oscillatory rheological techniques, Surface treatment, polymer alignment, Aerosil network, ITO electrode pattern formation, nanoparticles, Optical devices, LCD devices, Lasers and optoelectronics, Electronics and Electrical Circuit Designing and, Instrumentation.
- Software** 📌 Python, Matlab, Labview, C, C++, Visual Basic, Origin, Excel Macros etc.
- Other Skills** 📌 Artificial Intelligence, Data Science, Machine Learning, Deep Learning, Internet of Things (IoT), Jetson Nano, Arduino related projects, sensors, git-hub platform, device fabrication, Electrical and Electronics, Instrumentation, etc.




Research Experience

- 2021–2022 📌 **Research Specialist**, University of Illinois, Chicago, USA.
- 2019–2021 📌 **Visiting Scientist**, Weizmann Institute of Science, Israel.
📌 **Post-doctoral Researcher**, The Hebrew University of Jerusalem, Israel.
Project: Fluid dynamics: Laminar, Instability, Turbulence, Particle Image Velocimetry (μ -PIV) in 3D microfluidic channels.
- 2018–2019 📌 **Post-doctoral Researcher**, Indian Institute of Technology Madras, Chennai, India.
Project: Microfluidics (Producing drug particles with core-shell morphology for Pharmaceutical applications.)
- 2016–2017 📌 **Post-doctoral Researcher**, University of Gothenberg, Sweden.
Project: Particle Dynamics in Microfluidics.

Research Experience (continued)

- 2015–2016  **Provisional Research Associate**, Centre for Nano and Soft Matter Sciences, Bangalore, India.
Project: Pyroelectricity in Liquid Crystals.

Education

- 2009–2015  **Ph.D. in Physics**, Centre for Nano and Soft Matter Sciences (Affiliated to Mangalore University), Bangalore, India
Thesis title: Liquid Crystals: *Influence of Confined Geometry on Anisotropic Soft Matter*.
- 2007–2009  **M.Tech in Laser and Electro Optical Engg**, Anna University, Chennai, India
Thesis title: *Synthesis and Characterization of ZnO Thin film for electro optical applications*.
- 2005–2007  **M.Sc in Physics**, The American College, Madurai, India
Thesis title¹: *Concentration gradient Measurement using Optical Interferometry Techniques*.
Thesis title²: *Setting of Powder Xray Diffracto Meter with automated point detector*.

Research Publications

Journal Articles

- 1** **Vijay, K. M.**, Yang, D., Narsing Kumar, J., Varshney, A., & Steinberg, V. (2021a). Elastic instability, flow relaminarization and vortices suppression in viscoelastic flow. *Physical Review Letters, Preparation*.
- 2** **Vijay, K. M.**, Yang, D., Narsing Kumar, J., Varshney, A., & Steinberg, V. (2021b). Experimental study on phase diagram of a viscoelastic fluid flow in micro-channel. *Nature Communication, Preparation*.
- 3** Fries, J., **Vijay, K. M.**, Mihiretie, B. M., Hanstorp, D., & Mehlig, B. (2018). Spinning and tumbling of micron-sized triangles in a micro-channel shear flow. *Physics of Fluids*, 30(3), 033304.
- 4** Kamaliya, B., **Vijay, K. M.**, Yelamaggad, C., & Krishna Prasad, S. (2015). Enhancement of electrical conductivity of a liquid crystal-gold nanoparticle composite by a gel network of aerosil particles. *Applied Physics Letters*, 106(8), 083110.
- 5** **Vijay, K. M.**, Prasad, S. K., Marinov, Y., Todorova, L., & Petrov, A. (2015). Flexo-dielectro-optical spectroscopy as a method of studying nanostructured nematic liquid crystals. *Molecular Crystals and Liquid Crystals*, 610(1), 51–62.
- 6** Prasad, S. K., **Vijay, K. M.**, Shilpa, T., & Yelamaggad, C. (2014). Enhancement of electrical conductivity, dielectric anisotropy and director relaxation frequency in composites of gold nanoparticle and a weakly polar nematic liquid crystal. *RSC Advances*, 4(9), 4453–4462.
- 7** **Vijay, K. M.**, Krishna Prasad, S., Rao, D. S., & Mukherjee, P. (2014). Competition between anisometric and aliphatic entities: An unusual phase sequence with the induction of a phase in an n-alkane–liquid crystal binary system. *Langmuir*, 30(15), 4465–4473.
- 8** Krishnamurthy, K., Kumar, P., & **Vijay, K. M.** (2013). Polarity-sensitive transient patterned state in a twisted nematic liquid crystal driven by very low frequency fields. *Physical Review E*, 87(2), 022504.
- 9** Prasad, S. K., **Vijay, K. M.**, & Yelamaggad, C. (2013). Dual frequency conductivity switching in a carbon nanotube/liquid crystal composite. *Carbon*, 59, 512–517.
- 10** Rao, D. S., **Vijay, K. M.**, Prasad, S. K., Hiremath, U. S., Sarvamangala, M., & Basavaraja, S. (2013). Novel columnar–calamitic phase sequences in a binary system of bent-core and rod-like mesogens. *Journal of Materials Chemistry C*, 1(45), 7488–7497.

- 11 Sarvamangala, M., **Vijay, K. M.**, Khened, S., Basavaraja, S., Rao, D. S., & Prasad, S. K. (2013). Anomalous dielectric behavior in the nematic and isotropic phases of a strongly polar–weakly polar binary system. *Phase Transitions*, 86(5), 454–462.
- 12 **Vijay, K. M.**, & Krishna, P. S. (2013). Composites of single walled carbon nanotubes and liquid crystals as switchable conductors. *Nanosystems: Physics, Chemistry, Mathematics*, 4(3), 425–429.
- 13 **Vijay, K. M.**, Prasad, S. K., Rao, D. S., & Pozhidaev, E. (2013). Confinement driven effects in a room temperature ferroelectric liquid crystal: X-ray, linear and non-linear dielectric investigations. *Phase Transitions*, 86(4), 323–338.
- 14 Sarvamangala, M., **Vijay, K. M.**, Khened, S., Shankar Rao, D., & Prasad, S. K. (2012). Dielectric behavior in the nematic and isotropic phases of a strongly polar-weakly polar binary system. *AIP Conference Proceedings*, 1447(1), 77–78.
- 15 **Vijay, K. M.**, & Prasad, S. K. (2012). Influence of quenched disorder created by nanosilica network on phase transitions in tetracosane. *RSC advances*, 2(22), 8531–8538.
- 16 **Vijay, K. M.**, Krishna Prasad, S., & Shankar Rao, D. (2010). Confinement-driven weakening of the rotator phase transitions in an alkane through a possible tricritical point. *Langmuir*, 26(23), 18362–18368.

Participated National/International Conference

1. One-day Inter–Collegiate Seminar on “Electronic Communication” on 11.2.2003, Department of Physics, V. V. Vanniperumal College for Women, Virudhunagar-626001, Tamilnadu, India.
2. One-day Inter–Collegiate Seminar on “Electronic Communication” on 11.2.2003, Department of Physics, V. V. Vanniperumal College for Women, Virudhunagar-626001, Tamilnadu, India.
3. 11th National Seminar on Crystal Growth (with International Participation), during December 7-9, 2006, SSN College of Engineering, SSN Nagar, Kalavakkam - 603110, Chennai, Tamilnadu, India.
4. 2nd National Symposium on Non-Linear Optical Crystals and Modeling in Crystal Growth during March 26-27, 2007. Department of Physics, Anna University, Chennai-600025, Tamilnadu, India.
5. 17th National Conference on Liquid Crystals during 15-17 November, 2010, Department of Chemistry, VeerNarmad South Gujarat University, Surat-395007, Gujarat, India.
6. 18th National Conference on Liquid Crystals during 15-17 November, 2011, Department of Physics, North Eastern Regional Institute of Science Technology, Itanagarat-791109, Arunachal Pradesh, India.
7. IUPAC–Sponsored International Symposium on Macro-And Supramolecular Architectures and Materials: Nano System and Applications, Organized by Centre for Nano Science and Technology K.S. Rangasamy College of Technology, Thrichencode-637 215, Tamilnadu, India.
8. 21th National Conference on Liquid Crystals during 10-12 November, 2014, Vikramajit Singh Sanatan Dharm (VSSD) College, Chhatrapati Shahu Ji Maharaj University, Kanpur, India.
9. 25th International Liquid Crystal Conference ILCC2014 29 June -4 July 2014 Conference Centre, Arts Block, Trinity College Dublin, Dublin 2, Ireland.
10. International conference on Bottlenecks for particle growth in turbulent aerosols in May 25, 2016, University of Gothenberg in Sweden.
11. One day Workshop in Indian institute of Technology Madras, Chennai, October 30, 2018, India.
12. One day International conference conducted by Microsoft: Internet of Things(IoT) in Action, December 11, 2019, Tel Aviv, Israel.

Computer Skills

Hardware	📌	Technical problem solving, Assembling Computer, Data Acquisition, Interfacing Instrument, Network handling etc.
Operating System	📌	Windows, DOS and Linux
Coding	📌	Matlab, Python, Labview, C, C++, \LaTeX
Languages	📌	Strong reading, writing and speaking competencies for English
Misc.	📌	Academic research, teaching, training, \LaTeX typesetting and publishing.

Miscellaneous Experience

Awards and Achievements

- 2016 📌 **Scholarship**, Carl Tryggers Foundation for Scientific Research, Sweden.
- 2014 📌 **International Travel Support**, Department of Science and Technology, New Delhi, India.

References

Prof. S Krishna Prasad

Honorary Professor,
Centre for Nano and Soft Matter Sciences,
P.B.No. 1329, Prof. U.R. Rao Road,
Bengaluru, Karnataka-560 013, India
✉ skprasad@cens.res.in ✉ skpras@gmail.com
🌐 <https://www.cens.res.in/en/faculty/prasad>

Prof. Dag Hanstorp

Professor, Department of Physics,
University of Gothenburg,
SE-412 96 Gothenburg, Sweden.
✉ dag.hanstorp@physics.gu.se
🌐 <https://www.physics.gu.se/english/about-the-department/staff?userId=xhanda>

Prof. Alexander G. Petrov

Emeritus Professor
Institute of Solid State Physics,
Bulgarian Academy of Sciences,
72, Tzarigradsko Chaussee, Blvd.,
1784 Sofia, Bulgaria.
✉ agpetrov1948@yahoo.co.uk
🌐 <http://www1.issp.bas.bg/staff/agpetrov/cv.html>

Prof. Victor Steinberg

Emeritus Professor
Weizmann Institute of Science,
Rehovot, Israel.
✉ victor.steinberg@weizmann.ac.il
🌐 <http://www.weizmann.ac.il/complex/steinberg/home>

Prof. Lachezar Komitov

Professor emeritus,
Department of Physics,
University of Gothenburg,
SE-412 96 Gothenburg, Sweden.
✉ lachezar.komitov@physics.gu.se
🌐 <https://www.physics.gu.se/english/about-the-department/staff?languageId=100001&userId=xkomla>