Curriculum vitae

Jagannathan Thimmarajampet Kalathi

Assistant Professor (Oct 2013 to present)
Department of Chemical Engineering
National Institute of Technology Karnataka (NITK), Surathkal
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Post-Doctoral Research Scientist (Nov 2010 – Sep 2013)
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EDUCATION

Ph.D. (Chemical Eng.) **2011**	Indian Institute of Technology Madras (**IIT Madras**) CGPA: **9.2/10** (Credentials in the coursework) Area of work: **Modelling of flow induced by ultrasound and its applications**
M.Tech. (Chemical Eng.) **2005**	National Institute of Technology Karnataka (**NITK**), Surathkal CGPA: **8.06/10**, First Class with Distinction Specialization: **Industrial Pollution Control**
B.E. (Chemical Eng.) **2000**	Annamalai University, Chidambaram Marks secured: **78.00 %**, **First Class with Distinction**
H.S.C.C **1996**	Board of Higher Secondary Examination, Tamilnadu, India Marks secured: **80.50 %**
S.S.L.C **1994**	Board of Secondary Education, Tamilnadu, India Marks secured: **88.40 %**

RESEARCH PROFILE

Post-doctoral Research: Molecular Dynamics Simulations of Polymer Nanocomposites

Synopsis: Polymer nanocomposites are preferred over neat polymers since they offer desirable properties for specific applications with excellent mechanical strength. The nanosize effects of filler particles are generally responsible for the observed property enhancement. The research work focused on the investigation of nanoparticle size effects on the dynamics and rheology of polymer nanocomposites using molecular dynamics simulations.

Ph.D. Thesis: Mechanistic modeling, visualization, and applications of flow induced by high-intensity, high-frequency acoustic fields

Synopsis: Power ultrasound is generally used to enhance the conventional unit operations such as mixing, heat transfer, mass transfer and certain chemical reactions. The principal phenomena behind the enhancement of (rates of) processes are cavitations and acoustic streaming that are induced by coupling ultrasound with processing medium effectively. These effects typically depend on the characteristic frequency of ultrasound. In this work, liquid-flow induced by high-intensity, high-frequency acoustic fields in a frequency range of 25-470 kHz was characterized via CFD modeling and PIV experiments. Ultrasound-assisted thermal destratification in water/LN_2 storage tanks and effervescent atomization processes were also investigated.

M.Tech. Thesis: Studies on anaerobic degradation of phenol in wastewater

Synopsis: The aim of the project was to mineralize completely the toxic and carcinogenic pollutant, phenol, which is present in effluents of various chemical industries. Biological treatment methods are preferred over abiotic methods as they lead to complete mineralization of phenol. The performance of Up-flow Anaerobic Filter (UAF) for the degradation of phenol present in synthetic wastewater was studied. A typical UAF was designed, fabricated, and operated. Phenol degradation with removal efficiencies of 64-90 % was achieved under a different set of operating conditions. The process also produced a mixture of methane and CO_2, the biogas, which was collected as fuel and it was demonstrated as an energy recovery method from phenolic wastewaters.

RESEARCH AREAS OF INTEREST

- Dynamics of complex fluids
- Molecular simulations
- Polymers and nanocomposites
- Process intensification using power ultrasound

COMPUTATIONAL SKILLS

- Programming**:** MATLAB, FORTRAN, Familiar with C, C++
- Computational Fluid Dynamics Tools**:** GAMBIT, ANSYS
- Molecular Dynamics tools: LAMMPS, VMD

WORKSHOPS ORGANIZED

- Coordinated the workshop on 'Recent Challenges in Atmospheric and Earth Sciences' held at NITK during 27th - 30th Dec 2014 (Sponsored by TEQIP-I)
- Co-convener for “Chemference 2009”, Annual Research Symposium organized at IIT Madras, India

WORKSHOPS ATTENDED

- Faculty Development Programme held at NITK-STEP during Dec 16-26, 2013.
- One-day Workshop on “Workplace Sensitization” held at NITK, Nov 22, 2013.
- STC on “Thermodynamic Analysis of Modern Separation Processes” held at IITM during Nov24-28, 2014

COURSES TAUGHT @ NITK

1. Chemical Reaction Engineering – I (UG Level) (Jan-May 2014, Jan-May 2015)
2. Momentum Transfer (UG Level) (Jul-Dec 2014, Jul-Dec 2015)
3. Transport Phenomena (PG Level) (Jul-Dec 2014-2017)
4. Mathematical modeling of Environmental Systems (PG Level) (Jan-May, 2014-2017)
5. Introduction to Molecular Simulations (UG level) (Jan-May 2016, Jul-Dec, 2017): This course is proposed and offered for the first time by me at NITK.

PUBLICATIONS

Journals

1. Buruga, K., **Kalathi, J. T.** Fabrication of γ-MPS modified HNTs-PMMA nanocomposites by ultrasound-assisted mini-emulsion polymerization, **The Journal of The Minerals, Metals & Materials Society (Springer), 70(7), pp1307-1312, 2018**. (doi: https://doi.org/10.1007/s11837-018-2829-9)

2. Kishore Kumar, M.J., **Kalathi, J. T.** Low-temperature sonochemical synthesis of high dielectric Lanthanum doped Cerium oxide nanopowder, **Journal of Alloys and Compounds 748, pp 348-354, 2018**. (doi: https://doi.org/10.1016/j.jallcom.2018.03.096)

3. Buruga, K., **Kalathi, J. T.**, Ki-Hyun Kim, Yong Sik Ok, Boukhvalov Danil. Polystyrene-halloysite nanotube membranes for water purification, **Journal of Industrial and Engineering Chemistry 61, pp 169-180, 2018** (doi: https://doi.org/10.1016/j.jiec.2017.12.014)

4. Buruga, K., **Kalathi J. T.** A facile synthesis of halloysite nanotubes based polymer nanocomposites for glass coating application, **Journal of Alloys and Compounds 735, pp 1807-1817, 2018**. (doi: https://doi.org/10.1016/j.jallcom.2017.11.211)

5. Buruga, K., **Kalathi, J. T**. Sonochemical Synthesis of Cetyl Trimethylammonium Bromide modified Halloysite Nanotubes-Polystyrene Nanocomposites by solution casting method. **Asian Journal of Chemistry, 29 (1), pp 199-202, 2017**. (doi: https://doi.org/10.14233/ajchem.2017.20377)

6. Ge, T.; **Kalathi, J. T**., Halverson, J., Grest, G. S., Rubinstein, M. Nanoparticle Motion in Entangled Melts of Linear and Non-Concatenated Ring Polymers, **Macromolecules 50 (19), pp 1749-1754, 2017**. (doi: https://pubs.acs.org/doi/abs/10.1021/acs.macromol.6b02632)

7. **Kalathi, J. T**., Kumar, S. K., Rubinstein, M., Grest, G. S. Rouse Mode analysis of chain relaxation in Polymer Nanocomposites, **Soft Matter 11(20)**, **pp 4123-32, 2015**. (doi: 10.1039/c5sm00754b)

8. **Kalathi, J. T.**, Kumar, S. K., Rubinstein, M., Grest, G. S. Rouse Mode analysis of chain relaxation in homopolymer melts, **Macromolecules 47(19), pp 6925-6931, 2014**. (doi:10.1021/ma500900b)

9. **Kalathi, J. T.**, Yamamoto, U., Schweizer, K. S., Grest, G. S., Kumar, S. K. Nanoparticles diffusion in polymer nanocomposites, **Physical Review Letters 112, pp. 108301, 2014.** (doi: http://dx.doi.org/10.1103/PhysRevLett.112.108301)

10. **Kalathi, J. T.**, Mohanan, S., and Nagarajan, R. Mechanistic modeling of destratification in cryogenic storage tanks using ultrasonics. **Ultrasonics 54, pp. 76-83, 2014.** (doi: http://dx.doi.org/10.1016/j.ultras.2013.05.009)

11. **Kalathi, J. T.**, Grest, G. S., Kumar, S. K. Universal viscosity behavior of Polymer Nanocomposites, **Physical Review Letters 109 (19), pp. 198301, 2012.** (doi: http://dx.doi.org/10.1103/PhysRevLett.109.198301)

12. **Kalathi, J. T.**, Nagarajan, R., Ramamurthy, K. Effect of ultrasound on bubble breakup within the mixing chamber of an effervescent atomizer. **Chemical Engineering and Processing: Process Intensification 50, pp. 305-311, 2011**. (doi: http://dx.doi.org/10.1016/j.cep.2011.01.006)

13. **Kalathi, J. T.**, Mohanan, S., Nagarajan, R. Experimental investigation of high-frequency, high-intensity ultrasonics for thermal destratification of liquids stored in insulated containers: Effect of storage pressure. **Int. Journal of Transport Phenomena 11 (4), pp. 283-308, 2010**.

14. **Kalathi, J. T.**, Nagarajan, R. Investigation of acoustic cavitation energy in ultrasonic tanks. **Journal of Pure and Applied Ultrasonics 32 (4), pp. 95-100, 2010.**

Conference Proceedings

15. Buruga, K., **Kalathi, J. T**. Ultrasound-assisted Synthesis of Poly(styrene-co methylmethacrylate)-HNT's Nanocomposites by in-situ Emulsion Copolymerization and its Characterization, ICAAMM-2016 proceedings publication in **Materials today Proceedings, 4, pp 7467-7474, 2017**. (doi: https://doi.org/10.1016/j.matpr.2017.07.078)

16. Buruga, K., **Kalathi, J. T**. Effects of Solvents on Structure, Morphology and Thermal Stability of Polystyrene-HNTs Nanocomposites by Ultrasound Assisted Solution Casting Method, ICEMS 2016 proceedings publication in **Materials Today: Proceedings 4, pp 9434–9439, 2017.** (doi: https://doi.org/10.1016/j.matpr.2017.06.199)

17. Buruga, K., **Kalathi, J. T.** (2017). Sonochemical Synthesis of Poly (Styrene-co-Methylmethacrylate)-HNT's Nanocomposites by Mini-emulsion Polymerisation, **ICACE 2016 proceedings: In: Mohan B. R., Srinikethan G., Meikap B. (eds.) Materials, Energy and Environment Engineering**, Springer, Singapore. ISBN 978-981-10-2674-4. (doi: https://doi.org/10.1007/978-981-10-2675-1_7)

18. Buruga, K., **Kalathi, J. T.** (2015). Studies on morphology and thermal stability of polystyrene-clay nanocomposites, **International Conference on New Frontiers in Chemical, Energy and Environmental Engineering 2015**, NIT Warangal, India.

19. **Kalathi, J. T.**, Kumar, S. K., Gary, G. S. (2013). Diffusion of nanoparticles in dense polymer melts, **APS March Meeting 2013**, Baltimore, USA.

20. **Kalathi, J. T.**, Kumar, S. K., Gary, G. S. (2012). Shear viscosity of polymer nanocomposites from NEMD simulations, **APS March Meeting 2012**, Boston, USA.

21. Kumar, S. K., **Kalathi, J. T.**, Grest, G.S. (2012). Non-Einstein viscosity behavior of polymer nanocomposites, Abstracts of paper of the American Chemical Society. Vol. 244. **ACS Meeting 2012**, Washington, DC, USA.

22. **Kalathi, J. T.**, Nagarajan, R., Sivakumar, C. (2008). Visualization of Ultrasonically-induced Flow using Particle Image Velocimetry (PIV). **The 13th International Symposium on Flow Visualization (ISFV)**, July 1-4, 2008, Nice – French Riviera, France.

23. Nagarajan, R., Menon, P., Vetrimurugan, R., **Kalathi, J. T.** (2007). Visualization of high-frequency, high-intensity ultrasonic fields using PIV. **6th Pacific Symposium on Flow Visualization and Image Processing (PSFVIP)**, May 16-19, 2007, Hawaii, USA.

24. **Kalathi, J. T.**, Nagarajan, R. (2007). Theoretical and experimental studies of acoustic cavitation in ultrasonic tanks. **Chemcon-2007**, Dec 26-30, 2007, Kolkata, India.

25. **Kalathi, J. T.**, Choudhary, S. K., Nagarajan, R., Ramamurthy, K., Srinivasan, K. (2009). Ultrasonically enhanced atomization. **ChEmference'09- Annual Research Symposium**, Aug 22-23, 2009, IIT Madras, Chennai, India.

26. **Kalathi, J. T.**, Nagarajan, R. (2009). Investigation of acoustic cavitation energy in ultrasonic tanks. **18th National Symposium on Ultrasonics-NSU-XVIII**, Dec 21-23, 2009, VIT University, Vellore, India.

TALKS IN SEMINARS AND WORKSHOPS

1. A lecture on "Modelling of acoustic cavitation dynamics using MATLAB" during Two-day National Workshop on "Advanced Mathematical Approaches in Chemical and Environmental Engineering using MATLAB and Simulink" during Feb 28 - Mar 1, 2015, held at NIT Calicut, India.

2. A lecture on "Global Carbon Cycle" during Four-day National Workshop on "Recent Challenges in Atmospheric and Earth Sciences" during Dec 27-30, 2014, held at NITK, Surathkal, India.

PH.D. GUIDANCE:

Completed: 0 On-going: 2

M.TECH. THESIS GUIDANCE:

Completed: 1 On-going: 3

B.TECH. PROJECT GUIDANCE:

Completed: 3 On-going: 1

MANUSCRIPTS SUBMITTED TO JOURNALS:

SPONSERED PROJECTS:

PATENTS:

Indian Patent:

Kalathi, J.T., Kishor Kumar M. J, Pavan Pujar. "Method And System For Preparing A Lanthanum Zirconium oxide Based Dielectric Ink For Micro Electronics" (Application No. 201741045083) filed on 15/12/2017 at IPO, Chennai.