

## *Curriculum Vitae*

### **THOMAS G. THUNDAT**

Professor, Dept. Chemical and Biological Engineering  
University of Buffalo

#### **DEMOGRAPHIC AND PERSONAL INFORMATION**

##### **Current Appointments**

University

- 2017 - present Professor, Chemical and Biological Engineering, University of Buffalo
- 2010 - present Professor, Chemical and Biological Engineering, University of Alberta (LOA)
- 2016 - present Thousand Talent Professorship (foreigners), Shanghai Jiao Tong University
- 2013 - present Centenary Chair Professor, visiting, Indian Institute of Science, Bangalore, India
- 2009 - present Distinguished Professor (honorary), Indian Institute of Technology, Madras

##### **Personal Data**

##### **Education and Training**

- Ph. D., Physics, 1987, State University of New York at Albany
- M. Sc., Physics (First Class), 1980, Indian Institute of Technology, Madras, India
- B. Sc., Physics (major), Chemistry and Mathematics (minors), (First Class) 1978, University of Kerala, India
- Post-doctoral (scanning probe microscopy): 1987-1990 Arizona State University

##### **Past Professional Experience (in reverse chronological order):**

- 2010 - 2017 Canada Excellence Research Chair (CERC) Professor, University of Alberta
- 2012 - 2017 Fellow, National Institute of Nanotechnology (NRC, Canada)
- 2014 - 2016 Associate Director, India-Canada Center of Excellence (IC-IMPACTS)
- 2005 - 2010 UT-Battelle Corporate Fellow, Oak Ridge National Laboratory (ORNL)
- 2002 - 2005 Distinguished Scientist, ORNL
- 2001 - 2010 Research Professor/Joint Faculty, University of Tennessee, Knoxville, TN
- 1998 - 2002 Senior Scientist, ORNL
- 1998 - 2010 Group Leader, Nanoscale Science and Devices Group, ORNL
- 1996 - 2010 Visiting Professor, University of Burgundy, Dijon, France
- 1992 - 1998 Research Staff Member, ORNL
- 1983 - 1984 Graduate Research Intern, Bell Labs, Murray Hill, NJ

##### **Professional Society Fellowships:**

- Fellow, American Institute for Medical and Biological Engineering (AIMBE)(2017)
- Fellow, National Academy of Inventors (NAI)(2014)
- Fellow, Society for Optics and Photonics Engineers (SPIE) (2012)
- Fellow, American Society of Mechanical Engineers (ASME) (2010)
- Fellow, Electrochemical Society (ECS) (2008)
- Fellow, American Association for Advancement of Science (AAAS) (2006)
- Fellow, American Physical Society (APS) (2002)

### **Honors and Awards:**

- 2013 State University of New York, Albany, Distinguished Alumni Award
- 2010 R&D100 Award (Mode Synthesizing AFM)
- 2010 Outstanding Achievement Award, ECS Sensor Division
- 2007 Nano 50 Award
- 2007 Southeastern Federal Laboratory Consortium (FLC) Award, Honorable Mention
- 2006 UT - Battelle Significant Event Award
- 2005 National FLC Award
- 2004 Jesse Beams Award (Southeastern American Physical Society)
- 2004 Scientific American 50 Award
- 2004 Pioneer Awards, American Society of Mechanical Engineers (ASME)
- 2004 R&D 100 Award (explosive vapor sensor)
- 2004 National Federal Laboratory Consortium Award
- 2004 Distinguished Alumni Award, IIT Madras
- 2004 Life Sciences Division, Excellence in Research Award
- 2003 ORNL Inventor of the Year (Molecular comb)
- 2003 Southeastern Federal Laboratory Consortium Award
- 2003 Battelle Distinguished Inventor
- 2002 New York Kerala Center, Outstanding Accomplishments in Applied Sciences Award
- 2001 National Federal Laboratory Consortium Award
- 2000 Discover Magazine Award
- 2000 ORNL Inventor of the Year (cantilever sensors)
- 2000 UT - Battelle Technical Achievement Award for publication
- 2000 UT - Battelle Technical Achievement Award for Invention
- 1998 Lockheed Martin R&D Accomplishment Award
- 1997 ASME Emerging Technology Award
- 1997 Lockheed Martin R&D Accomplishment Award
- 1997 Lockheed Martin Publication Award
- 1996 U.S. Department of Energy Young Scientist Award
- 1996 R&D 100 Award (Cantilever IR sensors and Hg sensors)
- 1996 Lockheed Martin Publication Award
- 1996 Lockheed Martin Inventor's Award
- 1995 Health & Safety Research Division Excellence in Research Award
- 1994 Martin-Marietta Energy Systems Significant Event Award
- 1982 Outstanding Teaching Assistant Award, State University of New York
- 1978 National Merit Scholarship (India)

### **RESEARCH ACTIVITIES**

My rgroup's research activities are focused on understanding and manipulating nanomechanical effects at interfaces and using that knowledge for the development of high performance sensors, devices, and materials, for applications in health, environment, and energy. These interdisciplinary research efforts cover from basic research to design and development of complete systems. We have used molecular adsorption-induced stress as well as mass loading effects as the basis for developing microfabricated sensors. Although microfabricated cantilever sensors have extremely high sensitivity, they have very poor selectivity. To overcome this challenge we have used molecular engineering of immobilized interfaces to obtain chemical and biological selectivity. Although molecular engineering interfaces is very attractive, it suffers from reproducibility issues. To overcome this challenge we have developed a technique of nanomechanical spectroscopy where the adsorbed molecules are modulated with infrared

radiation and monitoring the resultant mechanical effects for molecular selectivity. Development of miniature sensors for applications turned out to be a challenge due to the large size of the batteries. To overcome this challenge we have pioneered new concept of transferring electrical power through a single wire. These reach activities of the last twenty-five years or so have resulted over 40 issued US patents, and over 400 refereed publications with total citation of over 12,000.

**Significant Career Accomplishments:**

- Pioneered the development of single wire (single contact) electricity transmission concept (2010)
- Developed hyphenated sensor concepts of combining electrical, optical, and mechanical resonances (2000)
- Pioneered the development of a novel class of physical, chemical, and biological sensors based on adsorption-induced force (1991)
- Developed and patented micromechanical infrared detection, imaging technique including mechanical IR spectroscopy (1995)

**Total number of referred publications: 402**

**Total number of conference proceedings: 58**

**Total Book chapters: 16**

**Total number of patents: 40**

**Total number of citations: 12,886 (web of science)**

**Average citation/item: 27.8**

**U.S. Patents Awarded (40 Issued 5 pending):**

1. A. Passian, T.G. Thundat, and L. Tetard, "Mode synthesizing atomic force microscopy and mode-synthesizing sensing", US Patent #8,789,211 B2 (2014)
2. A. Passian, T.G. Thundat, and L. Tetard, "Mode synthesizing atomic force microscopy and mode-synthesizing sensing", US Patent #8,448,261 B2 (2013)
3. T.G. Thundat, L.R. Senesac and C. Van Neste, "Acoustic enhancement for photo detecting devices", U.S. Patent #8,378,286 B2 (2013)
4. T.G. Thundat, C. Van Neste, G. Brown and L. Senesac, "Photoacoustic microcantilever", U.S. Patent #8,194,246 B2 (2012)
5. T.G. Thundat, C.W. Van Neste and A.A. Vass, "External split field generator", U.S. Patent # 8,120,225 B2 (2012)
6. T.G. Thundat, T.L. Ferrell and G.M. Brown, "Photoelectrochemical molecular comb", U.S. Patent # 8,110,082 B2 (2012)
7. T.G. Thundat, C.W. Van Neste and A.A. Vass, "Internal split field generator", U.S. Patent # 8,089,188 (2012)
8. C.W. Van Neste, M.E. Morales-Rodriguez, L.R. Senesac and T.G. Thundat, "Standoff spectroscopy using a conditioned target", U.S. Patent # 8,080,796 (2011)
9. Y. Dechang, L.R. Senesac and T.G. Thundat, "Sensor for detecting and differentiating chemical analytes", U.S. Patent # 7,972,865 (2011)
10. C. Van Neste, L.R. Senesac and T.G. Thundat, "Photoacoustic point spectroscopy", U.S. Patent # 7,961,313 (2011)
11. T.G. Thundat, A. Passian and R.H. Farahi, "Microscale fluid transport using optically controlled Marangoni effect", U.S. Patent # 7,939,811 (2011)

12. C. Van Neste, L.R. Senesac and T.G. Thundat, "Reverse photoacoustic standoff spectroscopy", U.S. Patent # 7,924,423 (2011)
13. T.G. Thundat and G. M. Brown, "Electrochemical sensor having suspended element counter electrode and deflection method for current sensing", U.S. Patent # 7,716,965 (2010)
14. M. Su, T.G. Thundat and D. Hedden, "Method and apparatus for remote sensing of molecular species at nanoscale utilizing a reverse photoacoustic effect", U.S. Patent # 7,665,364 (2010)
15. V.I. Boiadjiev, G.M. Brown, L. Pinnaduwege, T.G. Thundat, P.V. Bonnesen and G. Goretzki, "Method for making gold thiolate and photochemically functionalizing microcantilevers", U.S. Patent # 7,579,052 (2009)
16. T.G. Thundat and R.J. Warmack, "Surface wave chemical detector using optical radiation", U.S. Patent # 7,243,548 (2007)
17. T.G. Thundat, T.L. Ferrell and G.M. Brown, "Photo-electrochemical molecular comb", U.S. Patent # 7,211,181 (2007)
18. L.A. Pinnaduwege, T.G. Thundat, G.M. Brown, J.E. Hawk and V.I. Boiadjiev, "Chemically functionalized microcantilevers for detection of chemical, biological, and explosive material", U.S. Patent # 7,207,206 (2007)
19. B.M. Evans, T.G. Thundat, R.D. Komistek, D.A. Dennis and M. Mahfouz, "In-vivo orthopedic implant diagnostic device for sensing load, wear, and infection", U.S. Patent # 7,097,662 (2006)
20. T.G. Thundat, T.L. Ferrell and G.M. Brown, "Photo-electrochemical molecular comb", U.S. Patent # 7,090,757 (2006)
21. J.W. Lee and T.G. Thundat, "Separation and counting of single molecules through nanofluidics, programmable electrophoresis, and nanoelectrode-gated tunneling and dielectric detection", U.S. Patent # 7,033,476 (2006)
22. J.W. Lee and T.G. Thundat, "DNA and RNA sequencing by nanoscale reading through programmable electrophoresis and nanoelectrode-gated tunneling and dielectric detection", U.S. Patent # 6,905,586 (2005)
23. T.L. Ferrell and T.G. Thundat, "Spectrometry and filtering with high rejection of stray light", U.S. Patent # 6,831,747 (2004)
24. T.G. Thundat, T.L. Ferrell, K.M. Hansen, F. Tian, "High Throughput Microcantilever Detector", U.S. Patent # 6,763,705 (2004)
25. M.J. Doktycz, C.L. Britton, S.F. Smith, P.I. Oden, W. Bryan, J.A. Moore, T.G. Thundat and R.J. Warmack, "Micro-machined calorimetric sensors", U.S. Patent # 6,436,346 (2002)
26. T.G. Thundat and E.A. Wachter, "Piezoelectrically tunable resonance frequency beam utilizing a stress sensitive film", U.S. Patent # 6,336,366 (2002)
27. J.K. Davis, T.G. Thundat and E.A. Wachter, "Magnetically tunable resonance frequency beam utilizing a stress-sensitive film", U.S. Patent # 6,311,557 (2001)
28. T.G. Thundat, P.I. Oden, R.J. Warmack and E.L. Finot, "Micromechanical transient sensor for measuring viscosity and density", U.S. Patent # 6,311,549 (2001)
29. T.G. Thundat, K.B. Jacobson, M.J. Doktycz, S. J. Kennel and R.J. Warmack, "Micromechanical antibody sensor", U.S. Patent # 6,289,717 (2001)
30. T.G. Thundat, E.A. Wachter and J.K. Davis, "Electrostatically tunable resonance frequency beam utilizing a stress-sensitive film", U.S. Patent # 6,263,736 (2001)
31. T.G. Thundat, "Uncoated microcantilevers as chemical sensors", U.S. Patent # 6,212,939 (2001)

32. C.L. Britton, R.J. Warmack, W.L. Bryan, R. L. Jones, P.I. Oden and T.G. Thundat, "Capacitively readout multi-element sensor array with common-mode cancellation", U. S. Patent # 6,167,748 (2001)
33. T.G. Thundat, R.J. Warmack and E.A. Wachter, "Electromagnetic and nuclear radiation detector using micromechanical sensors", U.S. Patent # 6,118,124 (2000)
34. T.G. Thundat and M.J. Doktycz, "Micromechanical scanning differential calorimeter", U.S. Patent # 6,096,559 (2000)
35. T.G. Thundat, P.I. Oden and P.G. Datskos, "Non-contact passive temperature measuring system and method of operation using micro-mechanical sensors", U.S. Patent # 6,050,722 (2000)
36. T.G. Thundat, "Micro-mechanical potentiometric sensors", U.S. Patent # 6,016,686 (2000)
37. T.G. Thundat and R.J. Warmack, "High resolution three dimensional doping profiler", U.S. Patent # 6,005,400 (1999)
38. T.G. Thundat, "Microcantilever detector for explosives", U.S. Patent # 5,918,263 (1999)
39. T.G. Thundat, and E.A. Wachter, "Microcantilever sensor," U.S. Patent # 5,719,324 (1998)
40. E.A. Wachter, and T.G. Thundat, "Microbar sensor," U.S. Patent # 5,445,008 (1995)

## **PUBLICATIONS:**

**Total Peer Reviewed Journal Publications:** 402

**Web of Science - Refereed Journal Publications:** 402

**Total Citations:** ~ 12,872 **h-index:** 57

**Google Scholar – total citations** 20,797+, **h-index** 74, and **i-10 index** 296

(<http://scholar.google.ca/citations?user=5COIB58AAAAJ>)

## **2017**

1. S.C. Roy, T. Kundu, V.R. Ramgopal Rao, T. Thundat, "On-chip integration of photodetector and sensor: A multi-modal photonic device for sensing applications", IEEE Sensors Journal, 17, 4773-80 (2017).
2. Y.Q. Zhang, H.B. Tao, J. Liu, Y.F. Sun, J. Chen, B. Hua, T. Thundat, J.L. Luo, "A rational design for enhanced oxygen reduction: Strongly coupled silver nanoparticles and engineered perovskite nanofibers", Nano Energy, 38, 392-400 (2017).
3. B. Khorshidi, T. Thundat, D. Pernitsky, and M. Sadrzadeh, "A parametric study on the synergic impacts chemical additives on permeation properties of thin film composite polyamide membrane", Journal of Membrane Science, 535, 248-257 (2017).
4. X.C. Liu, I. Chae, N. Miriyala, D. Lee, T. Thundat, S. Kim, "Broadband mid-infrared standoff reflection-absorption spectroscopy using a pulsed external cavity quantum cascade laser", Applied Spectroscopy, 71, 1494-1505 (2017).
5. S. Chaudhari, K. Chaudhari, S. Kim, M.F. Khan, J. Lee, and T. Thundat, "Electrophoresis assisted time-of-flow mass spectrometry using hollow channel nanomechanical resonators", Sci. Reports, 7, 3535 (2017).
6. D. Zhang, T. Thundat, and R. Narain, "Flocculation and dewatering of fine mature tailing using temperature-response cationic polymers", Langmuir 33, 5900-09 (2017).
7. Z. Antic, S. Kuzman, V. Dordevic, M.D. Dramicanin, T. Thundat, "white- and blue-light emitting dysprosium(III) and terbium(III) doped gadolinium titanate phosphors, Luminescence 32, 539-544 (2017).

8. J.S. Chen, B. Yan, X.G. Wang, O.X. Huang, T. Thundat, H.B. Zheng, “Core cross-linked double hydrophilic block copolymer micelles based on multiple hydrogen bonding interactions”, *Polymer Chemistry*, 8, 3066-3073 (2017).
9. K.R. Jiang, Y.N. Yang, G. Thakur, Y. Kotsuchibashi, S. Naiker, R. Narain, T. Thundat, “Rapid and highly sensitive detection of dopamine using conjugated oxaborole-based polymer and glycopolymer systems”, *ACS Applied Materials and Interfaces*, 9, 15225-31 (2017).
10. Z. Li, K. Ahadi, K. Jiang, B. Ahvazi, P. Li, A.O. Anyia, K. Cadien, and T. Thundat, “Free standing hierarchical porous carbon film derived from hybrid nanocellulose for high power super capacitors”, *Nano Energy* 10, 1847-60 (2017).
11. S. Pendharker, H. Hu, S. Molesky, R. Starko-Bowes, Z. Poursofi, S. Parmanik, N. Nazemifard, R. Fedosejevs, T. Thundat, Z. Jacob, “Thermal grapheme metamaterials and epsilon-near-zero high temperature plasmonics”, *J. Optics*, 19, article # 055101 (2017).
12. Q. Chen, J. Liu, T. Thundat, M.R. Gray, Q. Liu, “Spatially resolved organic coating on clay minerals in bitumen froth revealed by AFM adhesion mapping”, *Fuel* 191, 283-289 (2017).
13. S. Seif, T. Thundat, and K. Cadien, “Evaluation of efficiency factors and internal resistance of thermoelectric materials”, *International Journal of Energy Research*, 41, 198-206 (2017).
14. B. Hua, M. Li, Y.F. Sun, Y.Q. Zhang, N. Yan, J. Chen, T. Thundat, J. Li, J.L. Luo, “A coupling for success: Controlled growth of Co/CoOx nanoshoots perovskite mesoporous nanofibers as high-performance trifunctional electrocatalysts in alkaline condition”, *Nano Energy*, 32, 247-254 (2017).
15. B. Khorshidi, B. Soltannia, T. Thundat, M. Sadrzadeh, “Synthesis of thin film composite polyamide membrane: Effect of monohydric and polyhydric alcohol additives in aqueous solution”, *J. Membrane Science* 523, 336-345 (2017).
16. D. Lee, I Chae, O. Kwon, K.H. Lee, C. Kim, S. Kim, T. Thundat, “Plasmonic absorbers with optical cavity for the enhancement of photothermal/opto calorimetric infrared spectroscopy” *App. Phys. Lett.*, 110, Article# 011901 (2017).
17. G. Haghghat, A. Sohrabi, P.M. Shaibani, C.W. Van Neste, S. Naicker, and T. Thundat, “The role of chloride ions in plasma-activated water treatment process”, *Environmental Science-Water Research and Technology.*, 3, 156-168 (2017).
18. P.M. Shaibani, H. Etaysah, S. Naicker, K. Kaur, T. Thundat, “Metabolic study of cancer cells using a pH sensitive hydrogel nanofiber light addressable potentiometric sensor”, *ACS Sensors*, 2, 151-156 (2017).
19. S.A.M. Bukhari, M.F. Khan, A. Goswami, R.M. McGee, T. Thundat, “Thermomechanical analysis of pico gram polymers using a suspended microchannel cantilever”, *RSC Advances*, 7, 8415-8420 (2017).

## 2016

20. A. Phani, V. Putkaradze, J.E. Hawk, K. Prashanthi, T. Thundat. “A nanostructured surface increases friction exponentially at the solid-gas interface”, *Sci. Reports*, 6, Article # 32996 (2016).
21. H. Itayash, M.F. Khan, K. Kaur, and T. Thundat, Microfluidic cantilever detects bacteria and measures their susceptibility to antibiotics in confined volumes, *Nature Comm.*, 7:12947, DOI:10.1038/ncomms12947 (2016).
22. Z. Antic, M. Dramicanin, K. Prashanthi, D. Jovanovic, S. Kuzman, and T. Thundat, Pulsed Laser Deposited Dysprosium-Doped Gadolinium–Vanadate Thin Films for Noncontact, Self-Referencing Luminescence Thermometry, *Advanced Materials*, DOI: 10.1002/adma.201601176 (2016).

23. N. Soin, P. Zhao, K. Prashanthi, J. Chen, P. Ding, E. Zhou, T. Shah, S.C. Ray, C. Tsonos, T. Thundat, E. Siores, J. Luo, "High performance triboelectric nanogenerators based on phase-inversion piezoelectric membranes of poly (vinylidene fluoride)-zinc stannate (PVDF-ZnSnO<sub>3</sub>) and polyamide", *Nano Energy*, 30, 470-480 (2016).
24. K. Prashanthi, J.E. Hawk, R. McGee, R. Gaikwad, and T. Thundat, "In-situ probing of thermal desorption of vapor molecules on a nanowire using work function variation", *Nano Research*, 9, 3334-33345 (2016).
25. C.W. Van Neste, R. Hull, J.E. Hawk, A. Phani, M.J. Unsworth, T. Thundat, "Electrical excitation of the earth for resonant, wireless power transfer", *Wireless Power Transfer*, 3, 117-125 (2016)
26. T. Abraham, A. Afacan, P. Dhandharia, and T. Thundat, Conduction and dielectric mechanisms in Athabasca oil sands with application to electrical heating, *Energy and Fuels*, 30, 5630-5642 (2016).
27. J. Liu, K. Prashanthi, Z. Li, R.T. McGee, K. Ahadi, and T. Thundat, Strain-induced electrostatic enhancement of BiFeO<sub>3</sub> nanowire loops, *Phys. Chem. Chem. Phys.*, 18, 22772-22777 (2016).
28. H. Etayash, A.R. McGee, K. Kaur, and T. Thundat, Nanomechanical Sandwich assay for multiple cancer biomarkers in breast cancer cell-derived exosomes, *Nanoscale*, DOI 10:1039/c6nr03478k (2016).
29. A.K. Pickering, Richard Hull, J.E. Hawk, Arindam Phani, C.W. Van Neste, and Thomas Thundat, Quasi wireless power and control for battery-free robotics, *Wireless Power Transfer*, 2, 134-142 (2016).
30. B. Khorshidi, A. Bhinder, T. Thundat, D. Pernitsky, and M. Sadrzadeh, Developing high throughput thin film composite polyamide membranes for forward osmosis treatment of SAGD produced water, *J. Membrane Science*, 511, 29-39 (2016).
31. Z. Li, J. Liu, K.R. Jiang, and T. Thundat, Carbonized nanocellulose sustainably boosts the performance of activated carbon in ionic liquid supercapacitors, *Nano Energy*, 25, 161-169 (2016).
32. M.F. Khan, N. Miriyala, J. Lee, M. Hassanpourfard, A. Kumar, and T. Thundat, Heat capacity measurements of sub-nanoliter volumes of liquids using biomaterial microchannel cantilevers, *Appl. Phys. Letts.*, 108, Article Number: 211906, DOI: 10.1063/1.4952614 (2016).
33. N. Miriyala, M.F. Khan, and T. Thundat, Thermomechanical behaviour of a biomaterial microchannel cantilever subjected to periodic IR radiation, *Sensor and Actuators B-Chemical*, 235, 273-279 (2016).
34. M.S. Ghoraishi, J.E. Hawk, A. Phani, M.F. Khan, and T. Thundat, "Clustering mechanism of ethanol-water mixtures investigated with photothermal microfluidic cantilever deflection" *Sci. Reports*, 6, DOI 23966, (2016).
35. B. Khorshidi, T. Thundat, B. Fleck, M. Sadrzadeh, "A novel approach toward fabrication of high performance thin film composite polyamide membranes", *Sci. Reports*, 6, Article# 22069 (2016).
36. J. Kim, Song, K. Kim, S. Kim, J. Song, N. Kim, M.F. Khan, N.L. Zhang, J.E. Sader, K. Park, D. Kim, T. Thundat, J. Lee, "Hollow Microtube Resonators via Silicon Self-Assembly toward Subattogram Mass Sensing Applications" *Nano Letters*, 16, 1537-45 (2016).
37. F. Khor, T. Thundat, and Z. Jacob, "Universal spin-momentum locked optical forces", *Appl. Phys. Letts*, 108, Article#061102 (2016).
38. A. Bhinder, T. Thundat, D. Pernitsky, M. Sadrzadeh, "Developing high throughput thin film composite polyamide membranes for forward osmosis treatment of SAGD produced water", *J. Membrane Science*, 511, 29-39 (2016).

39. P.M. Shaibani, K.R. Jiang, G. Haghghat, M. Hassanpourfard, H. Etayash, S. Naiker, and T. Thundat, "The detection of Escherichia coli (E. coli) with the pH sensitive hydrogel nanofiber-light addressable potentiometric sensor (NF-LAPS)", *Sensors and Actuators - B*, 226, 176-183 (2016).
40. T. Abraham, C. Van Neste, A. Afacan, and T. Thundat, "Dielectric relaxation-based capacitive heating of oil sands", *Energy & Fuels*, 30, 1987-1996 (2016).
41. M.H. Zarifi, M. Rahimi, M. Daneshmand, and T. Thundat, "Microwave ring resonator-based interface sensors for oil sands applications", *Sensors & Actuators-B*, 224, 632-639 (2016).
42. Z. Antic, K. Prashanthi, S. Culubrk, K. Vukovic, M.D. Dramicanin, T. Thundat, "Effect of annealing conditions on the structural and luminescent properties of Eu<sup>3+</sup> doped Gd<sub>2</sub>Ti<sub>2</sub>O<sub>7</sub> films", *App. Surf. Sci.*, 364, 273-279 (2016).
43. Z. Antic, V. Dordevic, M.D. Dramicanin, T. Thundat, "Photoluminescence of Eu(III)-doped Y<sub>x</sub>Sc<sub>(1-x)</sub>2O<sub>3</sub> nanoparticles: Linear relationship between structural emission properties", *Ceramic international*, 42, 3899-3906 (2016).
44. I. Chae, M.F. Khan, J. Song, T. Kang, J. Lee, T. Thundat, "Standoff mechanical resonance spectroscopy based on infrared sensitive hydrogel cantilevers", *Anal. Chem.*, 88, 9678-84 (2016)
45. S.S. Djokic, Z. Antic, N.S. Djokic, T. Thundat, "Galvanic deposition gold on silicon surfaces in Au(I) in alkaline fluoride-free solutions", *J. Electro. Chem. Soc.*, 163, D818-D820 (2016).
46. S.S. Djokic, Z. Antic, N.S. Djokic, K. Cadian, T. Thundat, "Galvanic process on silicon surfaces in Cu(II)alkaline fluoride-free solutions", *J. Electro. Chem. Soc.*, 163, D651-D654 (2016).
47. M. Hassanpourfard, R. Gosh, T. Thundat, A. Kumar, "Dynamics of bacterial streamers induced clogging in microfluidic devices", *Lab on a Chip*, 16, 4091-4096 (2016).

## 2015

48. A. Talukdar, M. Faheem Khan, Dongkyu Lee, Seonghwan Kim, Thomas Thundat and Goutam Koley "Piezotransistive transduction of femtoscale displacement for photoacoustic spectroscopy" *Nature Communications* 6, (2015).
49. L. Tetard, A. Passian, R.H. Farahi, T. Thundat, B.H. Davison, "Optomechanical spectroscopic material characterization", *Nature Nanotechnology*, DOI:1038/NNano.2015.168 (2015).
50. K. Prashanthi, A. Phani, and T. Thundat, "Photothermal electrical resonance spectroscopy of physisorbed molecules on a nanowire resonator," *Nano Letters* 15 (8), 5658–5663 (2015).
51. H. Etayash, KR Jiang, S. Azmi, T. Thundat, and K. Kaur, "Real-time detection of breast cancer cells using peptide functionalized microcantilever arrays", *Scientific Reports*, 5, 13967 (2015).
52. M. Hassanpourfard, Z. Nikakhtari, R. Ghosh, Siddhartha Das, Thomas Thundat, Yang Liu, and Alope Kumar, "Bacterial floc mediated rapid streamer formation in creeping flows." *Scientific Reports* no. 5:13070. doi: 10.1038/srep13070 (2015).
53. K. Prashanthi, P. Dhandraria, N. Miriyala, R. Gaikwad, D. Barlage and T. Thundat, "Enhanced photo-collection in single BiFeO<sub>3</sub> nanowire due to carrier separation from radial surface field," *Nano Energy* 13, 240–248 (2015).
54. J. Liu, R. Gaikwad, A. Hande, S. Das, and T. Thundat, "Mapping and quantifying surface charges on clay nanoparticles", *Langmuir*, 31, 10469-10476 (2015).
55. I. Chae, D. Lee, S. Kim, T. Thundat, Electronic Nose for Recognition of Volatile Vapor Mixtures Using a Nanopore-Enhanced Opto-Calorimetric Spectroscopy, *Anal. Chem.* 87 Issue: 14 Pages: 7125-7132 DOI: 10.1021/acs.analchem.5b00915 (2015).



56. B. Khorshidi, T. Thundat, B. Fleck, M. Sadrzadeh, Thin Film Composite Polyamide Membranes: Parametric Study on the Influence of Synthesis Conditions, *RSC Adv.*, 5, 54985-54997 (2015).
57. M. H. Zarifi, A. Sohrabi, P. M. Shabani, M. Daneshmand, and T. Thundat, "Detection Of Volatile Organic Compounds Using Microwave Sensors", *Sensors Journal*, IEEE 15(1), 248-254, (2015).
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#### **Book Chapters (partial list):**

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2. L. Norman, G. Thakur and T. Thundat, "Microcantilevers Sensors: Electrochemical Aspects and Biomedical Applications", in *Modern Aspects of Electrochemistry: Biomedical Applications Vol. 55*", edited by S. S. Djokic, Springer (2012).
3. T. Thundat, C.W. Van Neste, L.R. Senesac and A.R. Krause, "Photothermal Sensing of Chemical Vapors Using Microcantilevers" in *Nanotechnology for Electronics, Photonics, and Renewable Energy*, pp 183-192. Edited by A. Korkin, P.S. Krstić and J.C. Wells, Springer (2010).
4. R. Datar, T.L. Ferrell, and T. Thundat, "Microcantilever Biomedical Sensors" in *Nanomedicine: Design of Particles, Sensors, Motors, Implants, Robots, & Devices*, pp313-323. Edited by Mark J. Schultz, Vesselin N. Shanov, and Yeo Heung Yun, Artec House (2009).
5. Z. Hu, D. Zhou, R. Greenberg and T. Thundat, "Electrochemical characterization of implantable high aspect ratio nanoparticle platinum electrodes for neural stimulations" in *Artificial Sight: Basic research, biomedical engineering, and clinical advances*, pp243-254. Edited by Mark S. Humayun, James D. Weiland, G. Chader and Elias Greenbaum, Springer (2008).
6. L. Senesac and T. Thundat, "Explosive detection using microcantilever sensors", in *Counterterrorist Detection Techniques of Explosives*", J. Yinon, ed., Elsevier (2007).



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12. T. Thundat, P.I. Oden, and R.J. Warmack, "Physical, Chemical, and Biological Detection Using microcantilevers", *Molecular Nanotechnology*, IBC Publications, Ed. Shelly Minton (1997).
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14. T.L. Ferrell, D.P. Allison, T. Thundat, and R.J. Warmack, "Scanning Tunneling Microscopy in Sequencing of DNA", *Molecular Biology and Biotechnology: A Comprehensive Desk Reference*, R. A. Meyers, ed., VCH Publishers, Inc., New York, p. 851-53 (1995).
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16. S.M. Lindsay, T. Thundat, and L.A. Nagahara, "Imaging biopolymers under water by STM", in *Biological and Artificial Intelligence Systems*, pp 124-142 (Eds. E. Clementi and S. Chin) ESCOM, Leiden (1988).

**Professional Societies - Conference Organizer (Last 10 years):**

- Co-Organizer, MRS Fall Symposium, Boston (2015)
- Co-Organizer MRS Fall Symposium, Boston (2014)
- Co-Organizer, SPIE Defense and Security Conference, Baltimore (2013)
- Co-Organizer, MRS Spring Meeting, San Francisco, (2012)
- Co-Organizer, SPIE Defense and Security Conference, Baltimore (2012)
- Co-Organizer, Sixth International Nanomechanics Workshop, Bombay, India (2012)
- Co-Organizer, ECS Meeting Symposium, Montreal, Canada, (2011).
- Co-Organizer, MRS Fall Meeting Symposium, Boston, MA, (2010)
- Co-Organizer, APS March meeting, Division of Biological Physics Symposium, Portland, OR, (2010).
- Co-Organizer, Fifth International Nanomechanics Workshop, Banff, Canada, (2010).
- Track Organizer, ASME NEMBIB 2009, Huston, TX, (2010).
- Organizer, Fifth International Conference on Nanomechanical Cantilever Sensors, Jeju Island, S. Korea, (2009).

- Co-Organizer, ECS Meeting, San Francisco, CA, (2009).
- Co-Organizer, ICMEMS – IIT Madras, India, (2009).
- Co-Organizer, MRS Fall Conference, Symposium on Biomedical Nanotechnology, Boston, MA, (2008).
- Co-Organizer, Fourth International Conference on Nanomechanics, Max Plank Institute, Mainz, Germany, (2008)
- Co-Organizer, Third ASME Nanomechanics Workshop, Denmark, (2006).
- Co-Organizer, MRS Symposium on Nanosensors, Boston, MA, (2006).
- Co-Organizer, Second ASME Nanomechanics Workshop, Knoxville, TN, (2005).
- Organizer and symposium chair, Nanomechanical Sensor Symposium, APS Meeting, Los Angeles, CA, (2005).
- Co-Organizer, Microcantilever Sensor Symposium, ECS Fall Meeting, Los Angeles, CA, (2005).

### **Invited Talks:**

#### **(Plenary, and Keynote, and Invited Seminars that I have personally given) (2017 -2000):**

1. “Photothermal chemical selectivity”, MRS Fall Meeting, Boston (Dec. 2016)
2. “Tesla’s Dream: Single Wire Electricity Transmission”, Yamagata University, Japan (Nov. 2016).
3. “Chemical Selectivity” Keynote talk, ECS Prime, Honolulu, Hawaii (Oct. 2016)
4. “Strides towards chemical selectivity”, International Workshop on Nanomechanics, Delft, The Netherlands, June 2016.
5. “Wire-free electricity transmission”, Delft University, 2016
6. “Tesla’s Dream Revisited”, Center for Nanophase Material Science, ORNL (2016)
7. “Chemical selectivity in MEMS sensors”, Cochin Nano, India (2016)
8. “Defect Engineering” Technical University Denmark, Copenhagen (2016)
9. “Story of a Cantilever: Nanomechanics at Interfaces” Distinguished Speaker Series, York University, Toronto (2015)
10. “Nanowire Calorimetry for Chemical sensing”, International Conference on MicroNanotechnology, Shanghai, China (2015)
11. “MEMS and NEMS for Molecular Recognition”, International Workshop on Nanotechnology, Kookmin University, Seoul (2015)
12. “Nanomechanical Systems: From Molecular Recognition to Energy Conversion” Plenary Talk, International Conference on Nanotechnology, Calgary (2015)
13. “Colloids in Confined Spaces”, Key Note address, International Conference on Colloids and Interfaces, Mainz, Germany (2015).
14. “Photothermal and photoacoustic spectroscopy” Invited talk, International Conference on Optical Properties of Materials, Montenegro, (2015).
15. “Mechanical Photothermal Spectroscopy”, University of Central Florida, Nanoscience Center, Jan. 2015.
16. “Chemical sensing through Calorimetry”, Texas Tech. University, Department of Chemical Engineering, June 2015.
17. “Nanomechanical Sensors” Invited talk, Biotronics 2014 international conference, Seoul, Korea, Sept. 2014.

18. "Nanoburning of Methanol", Plenary Talk, International Conference on Nanoenergy Conference, Beijing, Dc. 2014.
19. "Single wire electricity transmission", Shanghai Jiatong University, Department of Micro Nano Electronics, Shanghai (Dec. 2014).
20. "Sustained Electrical Power from Catalytic Burning of Methanol", Shanghai University, Department of Physics (Dec. 2014).
21. "Reviving Tesla for an array of possibilities", Leadership Lecture Series IIT Madras, May 2014
22. "Single wire power transmission", IEEE Seminar, IIT Bombay, May 2014
23. "Calorimetric Cantilever Sensors", Physics Department, IIT Madras, May 2014
24. "Nanomechanical sensors for biomedical applications", Amrita Institute, Center for Nanoscience, Cochin, May 2014
25. "Photothermal Nanomechanical Spectroscopy", NMC 2014 Madrid May 2014.
26. "Nanothermal Sensors", Center for Nanoscience, IISc Bangalore, December 2013.
27. "Thermomechanical Sensors", International Conference of Solid State Physics, New Delhi, December 2013
28. "Tip-induced nanolithography", SPIE Conference, Baltimore, April 2013.
29. "Standoff and point sensing sensing using MEMS", Keynote talk, International Conference on Emerging Electronics, IIT Bombay, December 2012.
30. "Micromechanical Sensors", Invited Tutorial, International Conference on Emerging Electronics, IIT Bombay, December, 2012.
31. "Subs-surface imaging in scanning probe microscopy", Cochin University, India, Dec. 2012
32. "Photothermal Spectroscopy and Microscopy", MRS Fall Meeting, Boston, 2012
33. Nanosensors, Public Lecture, University of Alberta, Oct., 2012
34. "Controlling fluid flow at microscale: Applications in sensing and biofilms", Plenary Talk ASME conference, San Juan, Puerto Rico, July 2012.
35. "Micro and Nanomechanics and Molecular detection", IIT Bombay Invited Tutorial, International Nanomechanics Workshop, Bombay, India, June 2012.
36. "Photothermal Spectroscopy", International Scanning Probe Microscopy Conference, Toronto, June 2012
37. "Micromechanical Sensing", Physics Department Colloquium, University of Alberta, Jan. 2012
38. "Cantilever Sensors", Technical University Denmark, Christmas Symposium 2011.
39. "Photothermal Cantilever Deflection Spectroscopy", Cochin University, India 2011
40. "Optically Directed Transport and Detection of Biomolecules", City College Dublin, Ireland (2011)
41. "Frizzy Hair, Nanomechanics, and Oil Sands, Tech Fest, IIT Bombay, 2011
42. "Molecular Recognition in Cantilevers" POSTECH, S. Korea, 2011
43. "Nanomechanical Sensors" National Academies Panel on Chemical and Biological Sensors, Washington, DC, (2010).
44. "Standoff Detection of Explosives", ACS Pacific Rim Conference, Hawaii, 2010
45. "Cantilever sensors" Keynote Address, ICONSAT, Indian Institute of Technology (IIT), Bombay, India, (2010).
46. "Molecular Speciation" IIT, Department of Physics Colloquium, Madras, India, (2010).

47. "Scanning probe microscopy and sub-surface imaging" Institute of Mathematical Sciences, Madras, India, (2010).
48. "Standoff and point detection", IIT, Department of Electrical Engineering, Madras, India (2010).
49. "Nanomechanical Systems", Columbia University, Dept. of Mechanical Engineering, NYC, (2009).
50. "MEMS and Molecular Recognition", Stevens Institute of Technology, Nanotechnology Institute, NJ, (2009).
51. "Cantilever-Based Biosensors", University of Miami, FL, (2009).
52. "Microcantilever Sensors", NEMS Workshop, California Institute of Technology, Pasadena, CA, (2009).
53. "Thermomechanical Systems", Plenary Talk, NanoGiga Conference, McMaster University, Hamilton, ON, (2009).
54. "Nanomechanical Sensing: Challenges and Opportunities", National Nanotechnology Initiative, Washington, D.C., (2009).
55. "MEMS and NEMS" Electrical Engineering Department, Pennsylvania State University, (2009).
56. "Chemical sensing using cantilever sensors" Chemistry Department, Drexel University, Philadelphia, PA, (2009).
57. "Nanomechanical Sensing", Mechanical Engineering Department, Vanderbilt University, Nashville, TN, (2009).
58. "Strategies for Molecular Recognition in MEMS", Keynote Address, ICMEMS, IIT Madras, Chennai, India, (2009).
59. "Molecular Recognition in MEMS Sensors", IIT Bombay, India, (2009).
60. "Nanoengineering Applications", Rajagiri School of Engineering, Cochin, India, (2009).
61. "Nanotechnology for Biomass Conversion", Botany Department, St. Theresa's College, Cochin, India, (2009).
62. Molecular Recognition in MEMS, University of Arkansas, Fayetteville, AR, (2008).
63. Nanomechanical Sensing", Mechanical Engineering Dept., Virginia Tech, Blacksburg, VA, (2008).
64. "Receptor-free biosensing", APS March Meeting, New Orleans, LA, (2008).
65. "Detection of IEDs", IED Detection Conference, Washington, D.C., (2008).
66. "Microcantilever Sensors", State University of New York Albany, NY, (2008)
67. "Integrated Nanomechanical Sensors", General Electric Company, Schenectady, NY
68. "Receptor-free mechanical sensing", Institute of Electrical and Electronics Engineers (IEEE) Sensor Conference, Atlanta, GA, (2007).
69. MEMS Sensors, Chemical Engineering Dept., Vanderbilt University, Nashville, TN (2007).
70. Chemical and biological sensing using cantilevers, Photonic West, San Jose, CA, (2007).
71. "Chemical and Biological Detection Using Cantilever Sensors", Pittcon Meeting, Chicago, IL, (2007).
72. Receptor-free sensing, SPIE Conference, Orlando, FL, (2007).
73. Receptor-free detection of chemicals, International Conference on Cantilever Sensors, Montreal, Canada, (2007).
74. Explosive Detection using Cantilever Sensors, US Army, ARDEC, Detroit, MI, (2006).
75. Microcantilever sensors, Material Research Society Conference Tutorial, Boston, MA, (2006).

76. Nanomechanical sensors, MRS Conference, Boston, MA, (2006).
77. Molecular recognition in MEMS sensors, Technical University, Denmark, (2006).
78. Cantilever Sensors, Max Plank Institute, Mainz, Germany, (2006).
79. Photothermal Spectroscopy, University of Burgundy, France, (2006).
80. Nanomechanical Sensors, International conference on scanning probe microscopy, Montpellier, France, (2006).
81. Selective and sensitive detection of analytes using MEMS, CEA, France (2006).
82. Cantilever Arrays, International Conference on Nanomechanics, Denmark, (2006).
83. Mechanical Sensors, Texas Tech University, Lubbock, TX, (2006).
84. Microcantilever Sensor Arrays, Sandia National Laboratory, Albuquerque, NM, (2006).
85. Explosive vapor sensing, DHS-DOE Workshop on Explosives, Albuquerque, NM, (2006).
86. MEMS Environmental Sensors, Workshop On Nanotechnology for EPA Applications, Raleigh-Durham, NC, (2006).
87. "Explosive vapor detection using cantilever sensors", American Chemical Society Meeting, Washington, D.C., (2005).
88. "Nanomechanical Sensor Arrays for Multiplexed detection of Chemicals", Weissberger/Williams Lecture, Eastman Kodak Company, Rochester, NY, (2005).
89. "Nanomechanical Sensors", National Academies (USA) Japan-US Workshop on sensors, Tsukuba, Japan, (2005).
90. "Cantilever Sensor Arrays for chemical sensing", Academia Sinica, Taiwan, (2005).
91. "Microcantilever Biosensors", Institute of Physics, Academia Sinica, Taiwan, (2005).
92. "Molecular recognition using MEMS arrays", ITRI, Taiwan, (2005).
93. "Nanobiology and Nanomechanics", Molecular Biology Department, University of Tennessee, Knoxville, TN, (2004).
94. "Nanomechanics", IIT, Madras, India, (2004).
95. "MEMS sensors", American Physical Society, March Meeting, Montreal, Canada, (2004).
96. "Molecular recognition using nanomechanics", ASME Workshop on Nanotechnology, Reno, NV, (2004)
97. "MEMS-based explosive detectors", ATF-DHS Workshop, Scottsdale, AZ, (2004).
98. "Microcantilevers and molecular recognition", MRS Spring Meeting, San Francisco, CA (2004).
99. "Frictional effects in MEMS", DOE Workshop on Friction, Oak Ridge National Laboratory, TN, (2004).
100. "Cantilevered MEMS sensors", Council for the Advancement of Science Writing (CASW) New Horizons in Science Briefing, Knoxville, TN, (2003).
101. "Explosive vapor detection using nanomechanics", NATO Advanced Studies Workshop, England, (2003).
102. "Micromechanical detection of chemical and biological warfare agents", Biodefense Conference, Washington, D.C., (2003).
103. "Cantilever array sensors", Protiveris Inc., Bethesda, MD, (2003).
104. "Molecular recognition using mechanical sensors", Rutgers University, NJ, (2003).
105. "Micromechanical sensors", Auburn University, Auburn, AB, (2003).

106. "Physical, chemical, and biological detection using cantilevers", Pittcon Meeting, Orlando, FL (2003).
107. "Environmental sensing using mechanical sensors", American Chemical Society, New Orleans, LA, (2003).
108. "MEMS and NEMS Sensors", Northwestern University, Evanston, IL, (2003)
109. "Detection of Terrorist weapons using microcantilever sensors", Lawrence Livermore National Laboratory, Livermore, CA, (2002).
110. "Mechanical Sensing", State University of New York Albany, NY, (2002).
111. "Microcantilever gas sensors", DARPA Workshop on Microsensors, Monterey, CA, (2002).
112. "Micromechanical Sensors", Nanotechnology Conference, Georgia Institute of Technology, Atlanta, GA, (2002).
113. "Micromechanical Sensors", Electrical Engineering Dept., Arizona State University, Tempe, AZ, (2002).
114. "MEMS and NEMS", Oak Ridge National Laboratory M&C Seminar, (2002).
115. "Environmental Sensing using Microcantilevers", Pittcon Meeting, New Orleans, LA, (2002).
116. "Nanofriction at electrified interfaces", ACS National Meeting, Orlando, FL, (2002).
117. "Microcantilever Biosensors," Materials Research Society Spring Meeting, San Francisco, CA, (2002).
118. "Terrorist Weapon Detection using microcantilevers", Scanning Microscopy Conference, Las Vegas, NV, (2002).
119. "Detection of terrorist threat using micromechanical sensors", AVS Topical Conference, Monterey CA, (2002).
120. MEMS and NEMS - Bridge to the Nanoworld, Mechanical Engineering Department, University of Tennessee, Knoxville, TN, (2002).
121. "Fundamental mechanisms in cantilever sensors", International Conference on Scanning Probe Microscopy, Tokyo, Japan, (2001).
122. "Microcantilever sensors", Scanning Microscopy conference, NY City, NY, (2001).
123. "Microcantilever Sensors", IIT Madras, Department of physics, Madras India, January 2001.
124. "Micromechanical Sensors", Department of Materials Science and Engineering, Ohio State University, Columbus, OH, (2001).
125. "Microcantilever chemical sensors", American Chemical Society, Ohio Valley Chapter, Columbus, OH (2000).
126. "Micromechanical sensors for biological applications", Monsanto Chemical Company, Saint Louis, MO, (2000).
127. "Micromechanical sensors", Department of Materials Science and Engineering, Ohio State University, Columbus, OH (2000).