

# Siva A. Vanapalli

Department of Chemical Engineering  
Texas Tech University, Lubbock, TX 79409

## Education

B.Tech. in Agricultural & Food Engineering, Indian Institute of Technology, Kharagpur, 1998

M.S. in Food Science, Pennsylvania State University, 2001

Thesis: *Influence of dispersed phase crystallization on the stability of emulsions*

Thesis Advisor: Prof. John N. Coupland

Ph.D. in Chemical Engineering, University of Michigan, 2006

Dissertation: *Polymer chain scission in extensional and turbulent flows and implications for friction drag technologies*

Thesis Advisor: Prof. Michael J. Solomon

## Professional Experience

Oct. 2008 - present Texas Tech University, Lubbock, TX

Assistant Professor, Department of Chemical Engineering

2006 - 2008

University of Twente, Netherlands

Postdoctoral fellow, Physics of Complex Fluids, Dept. of Applied Physics

Advisor: Profs. Frieder Mugele and Michel H. G. Duits

## Selected Honors/Awards

Chancellor's Council Distinguished Research Award, Texas Tech University, 2013

CAREER Award, National Science Foundation, 2012

Whitacre Engineering Research Award, Texas Tech University, 2012

Halliburton Teaching Excellence Award, Texas Tech University, 2011

Discovery Grant, American Brain Tumor Association (7 out of 104 applicants), 2010

Rackham Pre-doctoral Fellowship, University of Michigan, 2004

## Professional Affiliations

American Institute of Chemical Engineers, American Physical Society, American Chemical Society and Society of Rheology

## Summary of Publications and Citations

- Refereed Journal Articles: 33 published
- Refereed Book Chapters: 1 published
- 485 total citations as of 01/05/14
- Average number of citations per paper: 15.16 as of 01/05/14
- h-index: 14 as of 01/05/14

## Refereed Journal Publications

Asterisk indicates corresponding author(s).

33. Kim, J. and Vanapalli, S. A.\* Microfluidic production of spherical and non-spherical fat particles by thermal quenching of crystallizable oils. *Langmuir*, 29, 12307-12316, 2013.

32. Bilbao, A., Wajnryb, E., Vanapalli, S. A. and Blawdziewicz, J.\* Nematode locomotion in unconfined and confined fluids. *Physics of Fluids*, 25, 081902, 2013. (*Selected for AIP Press Release: How a worm became a swim model*)

31. Sun, M. and Vanapalli, S. A.\* Generation of chemical concentration gradients in mobile

- droplet arrays via fragmentation of long immiscible diluting plugs. *Analytical Chemistry*, 85, 2044-2048, 2013.
30. Khan, Z. S. and Vanapalli, S. A.\* Probing the mechanical properties of brain cancer cells using a microfluidic cell squeezer device. *Biomicrofluidics*, 7, 011806, 2013. (*Special Topic: Microfluidics in Cancer Research*).
  29. Maddala, J., Wang, W., Vanapalli, S.A.\* and Rengasamy, R.\* Traffic of pairs of drops in microfluidic ladder networks with fore-aft structural asymmetry. *Microfluidics and Nanofluidics*, 14, 337-344, 2013.
  28. Sun, M., Khan, Z. S. and Vanapalli, S. A.\* Blood plasma separation in a long two-phase plug flowing through disposable tubing. *Lab on a Chip*, 12, 5225-5230, 2012.
  27. Padmanabhan, V., Khan, Z. S., Solomon, D. E., Armstrong, A., Rumbaugh, K., Vanapalli, S. A. and Blawdziewicz, J.\* Locomotion of *C. elegans*: A piece-wise harmonic curvature-representation of nematode behavior. *PLoS One*, 7, e40121, 2012.
  26. Dewan, A., Jihye, K., McLean R. H., Vanapalli, S.A.\* and Karim, M. N.\* Growth kinetics of microalgae in microfluidic static droplet arrays. *Biotechnology & Bioengineering*, 109, 2987-2996, 2012.
  25. Chen, H., Lentz, D. M., Rhoades, A. M., Pyles, R. A., Haider, K. W., Vanapalli, S. A., Nunley, R. K. and Hedden, R. C.\* Surface infusion micropatterning of elastomeric substrates. *Microfluidics and Nanofluidics*, 12, 451-464, 2012.
  24. Sun, M., Bithi, S. S. and Vanapalli, S. A\*. Microfluidic static droplet arrays with tuneable gradients in material composition, *Lab on a Chip*, 11, 3949-3952, 2011. (*Selected as Cover Article*)
  23. Maddala, J, Srinivasan, B., Bithi, S. S., Vanapalli, S. A\*. and Rengasamy, R\*. Design of a model-based feedback controller for active sorting and synchronization of droplets in a microfluidic loop, *AIChE J*, 58, 2120-2130, 2011.
  22. Bithi, S. S. and Vanapalli, S. A\*. Behavior of a train of droplets in a fluidic network with hydrodynamic traps, *Biomicrofluidics*, 4, 044110, 2010. (*Selected as Research Highlight*).
  21. Vanapalli, S. A.\*, Duits, M. H. G. and Mugele, F. Microfluidics as a functional tool for cell mechanics, *Biomicrofluidics*, 3, 012006, 2009. (*Selected to be included in the Virtual Journal of Biological Physics*).

#### Prior to TTU

20. Li, Y., Vanapalli, S. A., Duits, M. H. G.\* Dynamics of ballistically injected latex particles in living human endothelial cells, *Biorheology*, 46, 309-321, 2009.
19. Vanapalli, S. A.\*, Li, Y., Mugele, F. and Duits, M. H. G. On the origins of the universal diffusive dynamics of endogenous granules in mammalian cells, *Molecular and Cellular Biomechanics*, 150, 1-16, 2009.
18. Duits, M. H. G., Li, Y. Vanapalli, S. A., Mugele, F. Mapping of spatiotemporal heterogeneous particle dynamics in living cells, *Physical Review E*, 79, 051910, 2009. (*Selected to be included in the Virtual Journal of Biological Physics*).
17. Vanapalli, S. A.\*, Wijnperle, D., van den Berg, A., Mugele, F. and Duits, M. H. G.\* Microfluidic valves with integrated structured elastomeric membranes for reversible fluidic entrapment and *in situ* channel functionalization, *Lab on a Chip*, 9, 1461-1467, 2009. (*Top ten downloaded articles in May*).

16. Vanapalli, S. A.\*, Banpurkar, A. G., van den Ende, D., Duits, M. H. G. and Mugele, F.\* Hydrodynamic resistance of single confined moving droplets in rectangular microchannels, *Lab on a Chip*, 9, 982-990, 2009.
15. Winkel, E. S., Oweis, G., Vanapalli, S. A., Perlin, M., Dowling, D. R., Solomon, M. J. and Ceccio, S. L.\* High Reynolds number turbulent boundary layer friction drag reduction from wall-injected polymer solutions. *Journal of Fluid Mechanics*, 621, 259-288, 2009.
14. Purnomo, E. H., van den Ende, D.\*, Vanapalli, S. A. and Mugele, F. Glass transition and aging in dense thermosensitive suspensions of microgel particles, *Physical Review Letters*, 101, 238301, 2008.
13. Gu, H., Malloggi, F., Vanapalli, S. A. and Mugele, F.\* Electrowetting-enhanced microfluidic device for drop generation, *Applied Physics Letters*, 93, 183507, 2008.
12. Vanapalli, S. A., Iacovella, C. R., Sung, K. E., Mukhija, D., Mirecki-Millunchick, J., Burns, M. A., Glotzer, S. C. and Solomon, M. J.\* Fluidic assembly and packing of microspheres in confined channels, *Langmuir*, 24, 3661-3670, 2008.
11. Sung, K. E., Vanapalli, S. A., Mukhija, D., McKay, H., Mirecki-Millunchick, J., Burns, M. A. and Solomon, M. J.\* Programmable fluidic production of microparticles with configurable anisotropy, *Journal of the American Chemical Society*, 130, 1335-1340, 2008.
10. Malloggi, F., Gu, H., Banpurkar, A. G., Vanapalli, S. A. and Mugele, F.\* Electrowetting- A versatile tool for microdrop generation. *European Physical Journal E – Soft Matter*, 26, 91-96, 2008.
9. Malloggi, F., Vanapalli, S. A., Gu, H. and Mugele, F.\* Electrowetting-controlled droplet generation in a microfluidic flow-focusing device. *Journal of Physics: Condensed Matter*, 19, 462101, 2007 (*Highlighted in Top Papers 2007 Showcase*).
8. Vanapalli, S. A.\*, van den Ende, D., Duits, M. H. G. and Mugele, F. Scaling of interface displacement in a microfluidic comparator. *Applied Physics Letters*, 90, 114109, 2007.
7. Vanapalli, S. A., Ceccio, S. L. and Solomon M. J.\* Universal scaling for polymer chain scission in turbulence. *Proceedings of the National Academy of Sciences USA*, 103, 16660-16665, 2006 (*Highlighted in Editorial Section: Turbulence muddles laminar flow scission*).
6. Vanapalli, S. A., Islam, M. T. and Solomon M. J.\* Scission-induced bounds on maximum polymer drag reduction in turbulent flows. *Physics of Fluids*, 17, 095108, 2005.
5. Islam, M. T., Vanapalli, S.A. and Solomon M. J.\* Inertial effects on polymer chain scission in planar elongational cross-slot flow. *Macromolecules*, 37, 1023-1030, 2004.
4. Vanapalli, S. A., Palanuwech, J. and Coupland, J. N.\* Stability of emulsions to dispersed phase crystallization-effect of oil type, dispersed phase volume fraction and cooling rate. *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 204, 227-237, 2002.
3. Vanapalli, S. A., Palanuwech, J. and Coupland, J. N.\* Influence of fat crystallization on the stability of flocculated emulsions. *Journal of Agriculture and Food Chemistry*, 50, 5224-5228, 2002.
2. Vanapalli, S. A. and Coupland, J. N.\* Emulsions under shear – formation of partially coalesced lipid structures. *Food Hydrocolloids*. 15, 507-512, 2001.
1. Vanapalli, S.A. and Coupland, J.N. Characterization of food colloids by phase analysis light scattering. *Food Hydrocolloids*, 14, 315-317, 2000.

### **Refereed Book Chapters**

Vanapalli, S. A. and Coupland, J. N. Orthokinetic stability of food emulsions. In *Food Emulsions* (ed. S. Friberg, K. Larsson, J. Sjoblom), 4<sup>th</sup> Edition, Marcel Dekker, New York, 2003.

### **Invention Disclosures**

- Solomon, M. J., Sung, K. E., Vanapalli, S. A., Mukhija, D., McKay, H. A., Millunchick, J. M. and Burns, M. A. Device for programmable synthesis of microparticles with configurable anisotropy. Invention disclosure, filed March 2007, UM Disclosure file 3669.
- Vanapalli, S. A. and Meng, S. Methods and devices to control fluid volumes, reagent and particle concentration in arrays of microfluidic drops nanoliter volumes with tuneable gradients in material composition. PCT application no. 61604785, filed Feb, 2012.
- Vanapalli, S. A. and Solomon, D. E. Multiplexed microfluidic viscometer for high throughput rheology. Provisional application no. 61712105, filed Oct, 2012.

### **Invited Lectures** (11)

- “Dynamics of drops in microfluidic networks – Platforms for rapid screening in biology and medicine”, School of Electrical and Computer Engineering, Royal Melbourne Institute of Technology, Melbourne, December 2012.
- “Dynamics of drops in microfluidic networks – Platforms for rapid screening in biology and medicine”, Department of Mechanical and Aerospace Engineering, Monash University, Melbourne, December 2012.
- “Microfluidic technologies for screening soft materials”, Proctor & Gamble Co., Cincinnati, OH, June 2012.
- “Lab-on-chip technologies for high throughput sample preparation and analysis”, SD Myers Inc., Tallmadge, OH, June 2012.
- “Dynamics of drops in microfluidic networks – Platforms for rapid screening in biology and medicine”, Department of Chemical Engineering, Indian Institute of Technology, Chennai, January 2012.
- “Microfluidics – The science of fluid manipulation at small scales”, TTU SACNAS Student Chapter, Texas Tech University, September 2011.
- “Hydrodynamics of drops in microfluidic devices”, Applied Mathematics Seminar, Texas Tech University, November 2011.
- “Microfluidic Cell Squeezer – A new tool for high throughput mechanical phenotyping of tumor cells”, TTUHSC Annual Cancer Symposium, Amarillo, April 2011.
- “Spatiotemporal dynamics of drops in microfluidic networks for designing fluidic processors”, Department of Mechanical Engineering, Louisiana State University, April 2011.
- “Droplet traffic and parking in microfluidic networks”, Physics of Complex Fluids Group, University of Twente, The Netherlands, November 2009.
- “Droplet traffic and parking in microfluidic networks”, Microfluidics MEMS and Nanostructures Group, ESPCI, Paris, November 2009.

### **Conference Presentations (Oral)** (46)

\* denotes presenter

- Khan, Z. S.\*, Kamyabi, N. and Vanapalli, S. A. Mechanical response of cancer cells in a microfluidic capillary, AIChE Meeting, November 2013, San Francisco, CA.
- Bithi, S. S., Wang, W. S., Sun, M., Blawdziewicz, J. and Vanapalli, S. A.\* Coalescing drops in microfluidic parking networks: A multifunctional platform for drop-based microfluidics, AIChE Meeting, November 2013, San Francisco, CA.

- Blawdziewicz, J.\*, Bilbao, A., Khan, Z. S., Vanapalli, S. A. and van Bussel, F. Gait adaptation of swimming *C. elegans*: Hydrodynamic efficiency and neuromuscular control, AIChE Meeting, November 2013, San Francisco, CA.
- Wang, W. S.\*, Maddala, J. M., Rengasamy, R. and Vanapalli, S. A. Droplet traffic in a microfluidic loop, AIChE Meeting, November 2013, San Francisco, CA.
- Bithi, S. S., Wang, W. S., Sun, M., Blawdziewicz, J. and Vanapalli, S. A.\* Simple microfluidic drop dilution platforms, Advances in Microfluidics and Nanofluidics Meeting, May 2013, Notre Dame, IN.
- Khan, Z. S.\*, Kamyabi, N. and Vanapalli, S. A. Hydrodynamic behavior of tumor cell in a confined model microvessel, American Physical Society Meeting, March 2013, Baltimore, MD.
- Patel, A.\*, Padmanabhan, V., Rumbaugh, K. P., Vanapalli, S. A. and Blawdziewicz, J. Nematode chemotaxis: Gradual turns, sharp turns and modulated turn angles, American Physical Society Meeting, March 2012, Baltimore, MD.
- Bilbao, A.\*, Padmanabhan, V., Rumbaugh, K. P., Vanapalli, S. A. and Blawdziewicz, J. Navigation and chemotaxis of nematodes in bulk and confined fluids, American Physical Society Meeting, March 2012, Baltimore, MD.
- Khan, Z. S.\*, Kamyabi, N., Sennoune, S., Martinez-Zaguilan, R. and Vanapalli, S. A. Mechanical phenotyping of tumor cells using a microfluidic cell squeezer device, Society of Rheology Meeting, February 2013, Pasadena, CA.
- Bithi, S. S., Wang, W. and Vanapalli, S. A.\* Collective hydrodynamics of non-coalescing and coalescing drops in a microfluidic parking network, American Chemical Society – Colloids and Surface Science Meeting, June 2012, Baltimore, MD.
- Kim, J.\* and Vanapalli, S. A. Scaling of dispersed phase flow transitions in a microfluidic flow-focusing device, AIChE Meeting, October 2012, Pittsburgh, PA.
- Sun, M., Bithi, S. S., and Vanapalli, S. A.\* Microfluidic static droplet arrays with tuneable concentration gradients, AIChE Meeting, October 2012, Pittsburgh, PA.
- Patel, A.\*, Bilbao, A., Padmanabhan, V., Khan, Z. S., Armstrong, A., Rumbaugh, K., Vanapalli, S. A. and Blawdziewicz, J. Chemotaxis of crawling and swimming *C. elegans*, American Physical Society – Division of Fluid Dynamics Meeting, November 2012, San Diego, CA.
- Bilbao, A.\*, Padmanabhan, V., Rumbaugh, K., Vanapalli, S. A. and Blawdziewicz, J. Nematode swimming and turning: Locomotion of *C. elegans* in bulk fluid and thin fluid layers, American Physical Society – Division of Fluid Dynamics Meeting, November 2012, San Diego, CA.
- Maddala, J.\*, Vanapalli, S. A., and Rengasamy, R. Origins of periodic and chaotic dynamics in a microfluidic loop device, American Physical Society – Division of Fluid Dynamics Meeting, November 2012, San Diego, CA.
- Khan, Z. S.\* and Vanapalli, S. A. Hydrodynamic behavior of tumor cells in a confined model microvessel, Society of Rheology Meeting, American Physical Society Meeting, March 2012, Boston, MA.
- Wang, W. S.\*, Maddala, J., Rengasamy, R. and Vanapalli, S. A. Role of structural asymmetry in controlling drop spacing in microfluidic ladder networks. American Physical Society Meeting, March 2012, Boston, MA.
- Bithi, S. S. and Vanapalli, S. A.\* Hydrodynamic self-rectification: A novel mechanism for generating uniform static droplet arrays in a microfluidic network, American Physical Society Meeting, March 2012, Boston, MA.

- Khan, Z. S., Kamyabi, N., Sennoune, S., Martinez-Zaguilan, R. and Vanapalli, S. A.\* Probing the mechanical and metastatic properties of tumor cells using a microfluidic cell squeezer device, Cancer Prevention and Research Institute of Texas Annual Meeting, October 2012, Austin, TX.
- Solomon, D. E.\* and Vanapalli, S. A. Multiplexed microfluidic viscometer for complex fluid rheology, International Congress on Rheology, August 2012, Lisbon, Portugal.
- Sun, M., Bithi, S. S., Solomon, D. E. and Vanapalli, S. A.\* Microfluidic drop arrays of tuneable composition for rapid screening of soft materials, International Congress on Rheology, August 2012, Lisbon, Portugal.
- Vanapalli, S. A. and Khan, Z. S.\* Engineering a microchip for rapid screening of the metastatic potential of brain tumor cells, American Brain Tumor Association Annual Meeting, July 2011, Chicago, IL.
- Maddala, J.\*, Vanapalli, S. A., and Rengasamy, R. Sort-synchronization in microfluidic loop devices with experimental uncertainties using a model predictive control framework, International Federation of Automatic Control World Congress, August 2011, Milano, Italy.
- Bithi, S. S. and Vanapalli, S. A.\* Hydrodynamic self-rectification: A novel mechanism for generating uniform droplet arrays in a microfluidic network, AIChE Meeting, October 2011, Minneapolis, MN.
- Dewan, A.\*, Kim, J., Bithi, S. S., Kerls, M., Vanapalli, S. A. and Karim, M. N. Single cell growth kinetics of algae, *Chlorella Vulgaris*, AIChE Meeting, October 2011, Minneapolis, MN.
- Bilbao, A.\*, Alavalapadu, A., Khan, Z. S., Solomon, D. E., Rumbaugh, K., Vanapalli, S. A. and Blawdziewicz, J. Propulsion of *C. elegans* crawling on a wet surface, American Physical Society – Division of Fluid Dynamics Meeting, November 2011, Baltimore, MD.
- Khan, Z. S. and Vanapalli, S. A.\* Hydrodynamic behavior of tumor cells in a confined model microvessel, Society of Rheology Meeting, October 2011, Minneapolis, MN.
- Bithi, S. S. and Vanapalli, S. A.\* Hydrodynamic feedback and self-rectification regulate the formation of Newtonian and viscoelastic droplet arrays in a microfluidic network, Society of Rheology Meeting, October 2011, Minneapolis, MN.
- Khan, Z. S.\* and Vanapalli, S. A. Hydrodynamic resistance of confined cells in rectangular microchannels, American Physical Society Meeting, March 2011, Dallas, TX.
- Maddala, J.\*, Srinivasan, B., Bithi, S., Vanapalli, S. A. and Rengasamy, R. Simulation studies of active control strategy for sort-synchronization of droplets in microfluidic loop device using model predictive control, AIChE Meeting, November 2010, Salt Lake City, Salt Lake City, UT.
- Bithi, S. S.\*, Maddala, J. M., Srinivasan, B., Rengasamy, R. and Vanapalli, S. A. Experimental and simulation studies of nonlinear dynamics of droplets in a microfluidic device, AIChE Meeting, November 2010, Salt Lake City, Salt Lake City, UT.
- Bithi, S. S. and Vanapalli, S. A.\* Microfluidic production of self-organized droplet arrays in a fluidic network with hydrodynamic traps, Society of Rheology Meeting, October 2010, Santa Fe, NM.
- Bithi, S. S. and Vanapalli, S. A.\* Design of a microfluidic device for droplet capture, Society of Rheology Meeting, October 2009, Madison, WI.
- Bithi, S. S. and Vanapalli, S. A.\* Microfluidics to characterize crystallization behavior of lipids, North American Thermal Analysis Society, September 2009, Lubbock, TX.

- Vanapalli, S. A.\*, Banpurkar, A. G., Malloggi, F., van den Ende, D., Duits, M. H. G. and Mugele, F. Controlling drop generation, size and traffic in microfluidic devices, AIChE Meeting, Philadelphia, November 2008, Philadelphia, PA.
- Vanapalli, S. A.\*, Banpurkar, A. G., van den Ende, D., Duits, M. H. G. and Mugele, F. Hydrodynamic resistance of single confined drops in microchannels, International Congress on Rheology, August 2008, Monterey, CA.
- Vanapalli, S. A.\*, Li, Y., Duits, M. H. G., Mugele, F. Linking probe transport and dynamics to intracellular rheology, Society of Rheology Meeting, October 2007, Salt Lake City, Utah.
- Sung, K. E., Mukhija, D., Vanapalli, S. A., McKay, H., Mirecki-Millunchick, J., Solomon, M. J.\* and Burns, M. A. Continuous fabrication of anisotropic particles by microfluidic processing. AIChE Meeting, November 2007, Salt Lake City, Utah.
- Sung, K. E.\*, Mukhija, D., Vanapalli, S. A., McKay, H., Mirecki-Millunchick, J., Solomon, M. J. and Burns, M. A. On-chip synthesis of anisotropic microparticles by microfluidic processing. Physics and Chemistry of Microfluidics, Gordon Research Conference, July 2007, Waterville Valley, NH.
- Sung, K. E., Mukhija, D., Vanapalli, S. A., McKay, H., Mirecki-Millunchick, J., Solomon, M. J.\* and Burns, M. A. Programmable manufacturing of anisotropic particle assemblies by fluidic processing. Materials Research Society Spring Meeting, April 2007, San Francisco, CA.
- Vanapalli, S. A. and Solomon M. J.\* Universal scaling for polymer degradation in turbulent flows. AIChE National Meeting, October 2005, Cincinnati, OH.
- Vanapalli, S. A.\*, Islam, M. T. and Solomon M. J. Polymer chain scission in extensional and turbulent flows. Annual European Rheology Conference, April 2005, Grenoble, France.
- Vanapalli, S. A.\*, Islam, M. T. and Solomon M. J. Effect of flow field on polymer chain scission in extensional and turbulent flows. 75<sup>th</sup> Society of Rheology Annual Meeting, Oct 2003, Pittsburgh, PA.
- Islam, M. T.\*, Vanapalli, S.A. and Solomon M. J. Effect of a stagnation point flow field on the mechanochemical degradation of flexible polymers. AIChE National Meeting, Nov 2002, Indianapolis, IN
- Islam, M. T.\*, Vanapalli, S.A. and Solomon M. J. Stretching and scission of polymer chains in a stagnation point flow at dilute concentrations, 76<sup>th</sup> ACS Colloid and Surface Science Symposium, June 2002, Ann Arbor, MI.
- Coupland, J.N.\* and Vanapalli, S.A. Emulsions under shear – formation of partially coalesced lipid structures, 5<sup>th</sup> International Hydrocolloids Conference, Sept 2000, Raleigh, NC.

### **Conference Presentations (Poster) (21)**

\* denotes presenter

- Rahman, M.\*, Khan, Z. S., van Bussel, F., Szewczyk, N. J., Blawdziewicz, J. and Vanapalli, S. A. Droplet-based microfluidic device for small animal drug screening, AIChE Meeting, November 2013, San Francisco, CA.
- Kamyabi, N.\*, Khan, Z. S. and Vanapalli, S. A. Mechanical phenotyping of tumor cells using a multiplexed microfluidic cell squeezer device, AIChE Meeting, November 2013, San Francisco, CA.
- Maddala, J.\*, Wang, W. S., Vanapalli, S. A. and Rengasamy, R. Origins of periodic and chaotic dynamics in microfluidic loop device, AIChE Meeting, November 2013, San Francisco, CA.

- Bithi, S. S.\*, Wang, W. S., Sun, M., Blawdziewicz, J. and Vanapalli, S. A. Collective hydrodynamics of non-coalescing and coalescing drops in a microfluidic parking network, Advances in Microfluidics and Nanofluidics Meeting, May 2013, Notre Dame, IN.
- Bithi, S. S.\* and Vanapalli, S. A. Hydrodynamic resistance and squeezing of trapped drops through a microfluidic constriction, Advances in Microfluidics and Nanofluidics Meeting, May 2013, Notre Dame, IN.
- Van Bussel, F.\*, Patel, A., Padmanabhan, V., Khan, Z. S., Vanapalli, S. A. and Blawdziewicz, J. An integrated method for quantification and analysis of motility in *C. elegans*, American Physical Society Meeting, March 2012, Baltimore, MD.
- Khan, Z. S.\*, Kamyabi, N., Sennoune, S., Martinez-Zaguilan, R. and Vanapalli, S. A. Mechanical response of a circulating tumor cell in a narrow microchannel, Society of Rheology Meeting, February 2013, Pasadena, CA.
- Solomon, D. E.\* and Vanapalli, S. A. Measurement of hydrodynamic resistance due to purely elastic instabilities in curvilinear microchannel flows, Society of Rheology Meeting, February 2013, Pasadena, CA.
- Kim, J.\* and Vanapalli, S. A. Scaling of flow transitions in a microfluidic flow-focusing device, American Chemical Society – Colloids and Surface Science Meeting, June 2012, Baltimore, MD.
- Kim, J.\* and Vanapalli, S. A. Microfluidic production of food emulsions containing anisotropic-shaped fat particles, AIChE Meeting, October 2012, Pittsburgh, PA.
- Khan, Z. S., Kamyabi, N., Sennoune, S., Martinez-Zaguilan, R. and Vanapalli, S. A.\* Probing the mechanical and metastatic properties of tumor cells using a microfluidic cell squeezer device, Cancer Prevention and Research Institute of Texas Annual Meeting, October 2012, Austin, TX.
- Solomon, D. E.\* and Vanapalli, S. A. Pressure drop due to purely elastic instabilities in curvilinear microchannel flow, International Congress on Rheology Meeting, August 2012, Lisbon, Portugal.
- Kim, J.\* and Vanapalli, S. A. Microfluidic production of food emulsions containing anisotropic-shaped fat particles, Institute of Food Technologists Meeting, June 2012, Las Vegas, NV.
- Vanapalli, S. A.\* and Khan, Z. S. Engineering a microchip for rapid screening of the metastatic potential of brain tumor cells, American Brain Tumor Association Annual Meeting, July 2011, Chicago, IL.
- Kim, J. and Vanapalli, S. A.\* Microfluidic production of crystalline fat droplets, Institute of Food Technologists Meeting, June 2011, New Orleans, LA.
- Solomon, D. E.\* and Vanapalli, S. A. Multiplexed microfluidic viscometer for complex fluid and blood rheology, Society of Rheology Meeting, October 2011, Minneapolis, MN.
- Aday, J. B.\* and Vanapalli, S. A. An integrated microfluidic device for blood plasma separation and encapsulation of nanoliter-scale droplets, Institute of Biological Engineering Meeting, March 2010, Cambridge, MA.
- Vanapalli, S. A.\*, Ceccio, S. L. and Solomon M. J. Onset of turbulence and scission in drag-reducing polymer solutions. AIChE National Meeting, November 2006, San Francisco, CA.
- Vanapalli, S. A.\* and Coupland, J.N. Freeze-thaw stability of emulsions, Institute of Food Technologists Annual Meeting, June 2001, New Orleans, LA.
- Vanapalli, S. A.\* and Coupland, J. N. Crystallization of emulsions under shear, Institute of Food Technologists Annual Meeting, June 2000, Dallas, TX.

Vanapalli, S.A.\* and Coupland, J.N. (1999). Measurement of zeta-potential in food colloids by Phase Analysis Light Scattering, Institute of Food Technologists Annual Meeting, June 1999, Chicago, IL.

### **Research Grants Funded**

13. I-Corps, Development and commercial feasibility of a microfluidic drug discovery kit. National Science Foundation, \$50,000, 10/01/13-03/31/14, Contribution: 100% as PI.

12. Locomotion of the nematode *C. elegans* in complex media, Texas Tech University, \$15,000, 03/15/13-03/14/14, Contribution: 33% as co-PI with PI Blawdziewicz (Mechanical Eng).

11. Development of low-cost microfluidic platforms for high-resolution drug screening, Texas Tech University, \$5,000, 03/15/13-03/14/14, Contribution: 100% as PI.

10. CAREER: Collective hydrodynamics of confined drops in microfluidic parking networks, National Science Foundation, \$400,000, 01/15/12-01/14/17, Contribution: 100% as PI. REU Supplement of \$ 6,000 was also received.

9. Defining the chemical and physical signature of breast cancer cells crossing the blood-brain barrier, Texas Tech University System, \$50,000, 01/15/12-01/14/17, Contribution: 50% as co-PI with PI Lockman (Pharmacy).

8. CDI: Engineering massively parallelized fluidic processors: From data to predictive models to functional designs, National Science Foundation, \$500,000, 09/01/11-08/31/14, Contribution: 50% as co-PI with PI Rengasamy (ChE).

7. Bounds on energy dissipation due to polymer-induced purely elastic stabilities in curved channel flows, Petroleum Research Fund, \$100,000, 09/01/10-08/31/12, Contribution: 100% as PI.

5. Microfluidics to probe partial coalescence in emulsions containing interfacial crystals, National Science Foundation, \$270,000, 05/15/10-05/14/13, Contribution: 100% as PI. REU Supplement of \$5,751 was also received.

4. Integrated microfluidic technology for high throughput screening of the metastatic potential of tumor cells, Cancer Prevention & Research Institute of Texas, \$199,796, 08/01/10-07/31/12, Contribution: 100% as PI (sub-contract of \$80,000 to Raul Martinez-Zaguilan, TTUHSC).

3. Engineering a microchip for rapid screening of the metastatic potential of brain tumor cells, American Brain Tumor Association, \$50,000, 07/01/10-06/30/11, Contribution: 100% as PI.

2. Collaborative Research: Probing the hydrodynamic resistance and traffic of confined droplets in microfluidic networks for the rational design of two-phase fluidic processors, National Science Foundation, \$91,785, 09/01/09-06/30/11, Contribution: 100% as Lead PI (Collaborating Investigator: Harris Wong, Mechanical Eng, LSU).

1. Microfluidic engineering of droplet shape and crystallinity for the design of low fat food emulsions, US Department of Agriculture, \$192,084, 09/01/09-08/31/12, Contribution: 100% as PI.

## **Courses Taught**

TTU course numbers: the first number indicates the level of the course, with 1-6 indicating freshman through advanced graduate.

ChE 5312 Fluid Transport Principles and Analysis  
ChE 3315 Fluid Mechanics  
ChE 4000/5000 Biomicrofluidics<sup>1</sup>  
ChE 5000-03 Functional Materials<sup>2</sup>

<sup>1</sup> New course, <sup>2</sup> Team-taught

## **Student Teaching Evaluations<sup>1</sup>**

Course	Typical Class Size	12/13	11/12	10/11	09/10
ChE 5312 Fluid Transport	15	4.20, 4.20	4.45, 4.40	4.38, 4.38	4.31, 4.44
ChE 3315 Fluid Mechanics	59	4.77, 4.83	3.35, 3.47	3.98, 4.07	
ChE 4000/5000 Biomicrofluidics	9				4.67, 4.56
ChE 5000-03 Functional Materials	12				n/a

<sup>1</sup> Scores are for questions 1 (instructor effectiveness) and 11 (overall value); out of a maximum of 5.0.

## **Graduate Theses Supervised**

Current Students: 7 Ph.D. and 1 BS/MS students.

1. Swastika Bithi, Ph.D., Dissertation topic: Droplet storage and dilution in microfluidic parking networks, 3 papers published, 1 submitted, expected Dec 2013.
2. Deepak Solomon, Ph.D. Dissertation topic: Microfluidic viscometry and dynamics of complex fluids, 1 accepted and 1 submitted papers, expected December 2013.
3. Kim Jihye, Ph.D., Dissertation topic: Microfluidic investigation of nucleation and crystallization in emulsions, 1 accepted paper, expected 2014.
4. William Wang, Ph.D. Dissertation topic: Drop traffic in microfluidic networks, 1 paper published, expected 2015.
5. Mizanur Rahman, Ph.D. Dissertation topic: Manipulation of *C. elegans* in microfluidic devices, expected 2016.
6. Nabiollah Kamyabi, Dissertation topic: Probing the hydrodynamics of circulating tumor cells using microfluidics, Ph.D. expected 2017.
7. Mehdi Nekouei, Ph.D. Break-up, coalescence and mixing in microfluidic drops, expected 2018.
8. Naureen Suteria, M.S. Hydrodynamic resistance of drops in microchannels, expected, 2015.

## **Post-Doctoral Associates Supervised**

Biddut Bhattacharya, Feb 2013 – Present, Drop-based microfluidics

Zeina Khan, Sept 2010 – Present, Cancer cell mechanics and mechanical phenotyping

Chad Paton, Sept 2010–Dec 2010, Circulating DNA detection using microfluidics

Meng Sun, Sept 2010 – Jan 2013, Droplet arrays with reagent concentration gradients

## **Undergraduate Research Supervised** (<sup>1</sup>Subsequent activity following graduation)

### **External Support:**

Daphne Huynh (ChE) Fall 2012 - Present

Braden Pate (ChE) Fall 2012/Spring 2013

Katelynn Dabbs (ChE) Spring/Summer 20012  
Naureen Suteria (ChE) Summer/Fall 2012  
Mohammed Elzubier (ChE) Spring 2010 - 2011  
Jennifer Henry (ChE) 2010 – Spring 2011, Quorum Business Solutions<sup>1</sup>  
Rebecca McLean (ChE) Fall 2009/2010  
Jeffrey Aday (Bio) Fall 2009 – Fall 2011, Med School<sup>1</sup>  
Ajeya Mandarapu (Bio) Fall 2009/2010, Med School<sup>1</sup>  
Abel Cortinas (ChE) Fall 2009/Spring 2010, MIT<sup>1</sup>  
Timmy Corini (ChE) Summer 2009  
Gilbert Salinas (ChE) Summer 2009, Valero<sup>1</sup>  
Francisco Amador (ChE) 2009, Texas Instruments<sup>1</sup>  
Rachel Green (ChE) Spring 2009, Conoco Phillips<sup>1</sup>

**For Credit:**

Amjad Abdel-Raziq (ChE) Spring 2013  
Ross McFall (ChE) Spring 2013, Med School<sup>1</sup>  
Jose Medina (ChE) Summer 2012  
Rebecca Gabriliska (Bio) Summer 2012  
Michael Atilano (ChE) Spring 2010  
Michelle Audsei (Bio) Spring/Summer 2009  
Joshua Wilson (ChE) Spring/Summer 2009  
Emily Kostelecky (Bio) 2009, Dental School<sup>1</sup>  
Bibi Olomola (Bio) Spring 2009

**High School Students Supervised** (<sup>1</sup>Subsequent activity following graduation)

Jain Sajnani, Summer 2010, Stanford University<sup>1</sup>  
Ashton Tipton, Summer 2013, Purdue University<sup>1</sup>  
Alice Xie, Summer 2013

**Student Awards**

1. Deepak Solomon (Ph.D. Student), 4<sup>th</sup> place in the poster competition at the Society of Rheology, 2013.
2. Swastika Bithi (Ph.D. Student), 2<sup>nd</sup> place in the graduate student poster competition at TTU, 2010.
3. Amjad Abdel-Raziq (Sophomore), Top Physical Sciences Poster Award at the TTU Undergraduate Research Conference, 2013.
4. Naureen Suteria (Junior), 1<sup>st</sup> place in the student paper competition in the Southwest AIChE Regional Conference, 2013.
5. Abel Cortinas (Junior), 1<sup>st</sup> place in the undergraduate poster competition at the Institute of Biological Engineering Conference, 2010.

**Thesis Committees** (not as Principal Advisor; Advisor's name is in parentheses)

Fahmida Irin (M. J. Green) Ph.D. Qual. Exam, 2012  
Mir Karim (R. S. Khare) Ph.D. Qual. Exam, 2012  
Yeuyi Xu (M. J. Green) Ph.D. Qual. Exam, 2012  
Sriya Das (M. J. Green) Ph.D. Qual. Exam, 2012  
Ben Xu (G. B. McKenna) Ph.D. 2012

Govind Hegde (R. S. Khare) Ph.D. 2012  
Swapnil Kohale (R. S. Khare) Ph.D. 2011

### **Service to Professional Organizations**

Session Co-Chair, Drops, bubbles and microfluidics, ACS Meeting, 2014  
Session Co-Chair, Interfacial Transport Phenomena, AIChE Meeting, 2013  
Session Co-Chair, Interfacial Rheology and Microfluidics, International Congress on Rheology Meeting, 2012  
Session Co-Chair, Microfluidics and Nanofluidics, Society of Rheology Meeting, 2010  
Session Co-Chair, BioMEMS and Microfluidics: Biomedical Diagnostics, AIChE Meeting, 2008  
Session Co-Chair, BioMEMS and Microfluidics: Cell and Biomolecule Analysis, AIChE Meeting, 2007

### **Reviewer**

Journal Reviewer for Science Translational Medicine, Angewandte Chemie International Edition, Lab on a Chip, Biomicrofluidics, Microfluidics and Nanofluidics, Langmuir, Biorheology, Journal of Non-Newtonian Fluid Mechanics, AIChE Journal, Journal of the American Oil Chemists' Society, Journal of Polymer Science Part B: Polymer Physics  
Reviewer for NSF CAREER Proposals, 2012  
Reviewer for NSF, ACS-PRF, NIH and NASA proposals

### **Departmental Service**

Faculty Search Committee, Member, 2012/13, 2011/12, 2010/2009  
Graduate Committee, Member, 2013 – 2011  
Undergraduate Scholarship Committee, Member, 2013 – 2011  
Safety Committee, Member, 2013

### **College/University Service**

Advisory Board, Society for Advancement of Chicanos and Native Americans in Science, 2009  
Cancer Institute Steering Committee, Member, 2010/11  
Transdisciplinary Academy Member, 2012  
Cross-Institutional Joint Appointment Committee, Member, 2013