

**Guiren Wang**  
Mechanical Engineering Department & Biomedical Engineering Program  
**University of South Carolina**, Columbia, SC, USA  
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### EDUCATION

Stanford University	Postdoc,	Mechanical Engineering	12/00 – 02/02
Technical University Berlin, Germany	Ph.D.,	Physical Engineering	11/91- 01/99
East China Univ. of Science and Technology	M.Sc.,	Chemical Engineering	09/85 - 09/88
Northwest University, Xian/China	B.Sc.,	Chemical Engineering	02/79 - 01/83

Strong background in multidisciplinary fields of biochips based on nano/microfluidic technology, diagnostic system for chemical/biological agents, biomedical devices, optical measurement method, fluid dynamics, turbulence, mixing and etc.

### WORK EXPERIENCES

- 08/07-present Assistant Professor, Mechanical Engineering Department & Biomedical Engineering Program, **University of South Carolina**, Columbia, SC, USA
- 11/05-11/06 Adjunct Professor, Chemical Engineering Department, **University of Alabama**, Huntsville, USA.
- 2/03-07/07 Principal research engineer, Biomedical Tech. Branch, **CFD Research Corp**, Huntsville, AL
- 3/02-1/03 Senior Engineer, **Amphora Discovery Corp**, Mountain View/CA
- 12/00 – 2/02 Postdoctoral Fellow, Mechanical Engineering Department, **Stanford University**
- 12/99 – 11/00 R&D manager, **Grace Fluids Engineering**, Mississauga, ON. Canada
- 02/99–11/99 Research Scientist, R&D group, **M&I Air Systems Engineering**, Mississauga, ON. Ca.
- 12/91 – 01/99 Research Assistant, Hermann-Foettinger-Institute, **Technical University Berlin**, Germany
- 4/83 - 8/85 and  
10/88 - 5/90 Lecturer, Dept. of Petrol. Chem. Eng., Liaoning University of Petrol. & Chem. Tech. China
- 9/85 – 9/88 Research Assistant, Chem. Eng. Dept. **East China University of Science and Technology**, China

### AWARD

- NSF CAREER award 2010
- Promising Investigator Research Award, USC 2010
- North American Mixing Forum Startup Grant Award, NAMF/AIChE 2009
- Industrial Fellowship from Material and Manufacturing Ontario, Canada. 1999

### PAST AND CURRENT RESEARCH PROJECTS

- MRI/NSF 01/15/11-01/14/14  
Role: **Principle Investigator**
- Colon Cancer Research Center, USC 07/19/10-07/18/11  
Seed fund Centers of Biomedical Research Excellence (COBRE)

Role: **Principle Investigator**

- CAREER/NSF 05/15/10-04/14/15 Role: **Principle Investigator**
- Promising Investigator Research Award, USC 04/10-03/11 Role: **Principle Investigator**
- North American Mixing Forum startup grant 01/01/10-12/31/11 Role: **Principle Investigator**

- DARPA/(SBIR): W31P4Q-07-C-0035 12/06-06/07 Role: **Principle Investigator**  
**Novel Nanofluidics-Based Sensor System**

Specific Aim: To design, fabricate and demonstrate nanoelectrophoresis in nanochannel to preconcentrate and separate sample to enhance sensitivity for chemical and biological sensor.

- NIH/SBIR: 1R43NS050011-01 9/04 – 09/05 Role: **Principle Investigator**

#### **A Novel Micro Thrombectomy Catheter for Ischemic Stroke**

Specific Aim: To design, fabricate and demonstrate a novel MEMS based thrombectomy catheter to treat acute ischemic stroke by increasing clinical safety and reducing cost.

- OSD(DoD)/SBIR: W81XWH06C0067 12/05 – 01/06 Role: **Principle Investigator**

#### **Novel Miniaturized, Electrothermal Activated, Optically Controlled, High throughput Noninvasive Drug Infusion Pump**

Specific Aim: To design, fabricate and demonstrate an electrothermal traveling wave micropump to increase throughput of drug delivery with precisely inline monitoring and control of the drug flow rate.

- HSARPA (SBIR): 06/05–12/06 04/06–03/08 Role: Co-Investigator

#### **A Novel Electrokinetics-Driven, Integrated Microfluidic Cartridge for Sample Preparation from Complex Matrices**

Specific Aim: To develop an integrated microfluidic cartridge (including cell sorter, cell lysis and DNA extraction and fluorescence detection) for biological agent detection against bioterrorists' attack.

- MCSC/(SBIR): 11/02 – 09/03 01/04–01/06 Role: Co-Investigator

#### **A Novel, Microfabricated, Electro-Immuno, Integrated Sensor-Sampler for Bioagent Collection and Detection**

Specific Aim: To design, fabricate and demonstrate a microfluidics based biosensor for environmental detection

- DHS S&T/HSARPA: NBCHC040110 04/04 – 10/04 Role: Co-Investigator

#### **A Novel Low Power, High Throughput, High Efficiency, Scalable Electrostatic Bioaerosol Sampler**

Specific Aim: To develop a low power, high throughput, high efficiency and scalable electrostatic bioaerosol sampler for biosample collection and preparation in a detection system.

- NIH/SBIR 2RH HL64500-02A1/03 09/02–10/05 Role: Co-Investigator

#### **Development of Improved Pediatric Spacer for Inhalers**

Specific Aim: To develop an inhaler with passive flow controlled pediatric spacer for drug delivery.

### **ACADEMIC AREAS OF INTEREST AND RESEARCH METHODS**

Nanotechnology, BioMEMS and Lab-on-a-Chip

- Nanofluidics: Transport phenomena in nanochannel
- Electrokinetics: (electrohydrodynamic instability, traveling wave electrothermal pump, dielectrophoresis for cell and particle separation, electroporation)
- Components and integration in nano/microfluidics: pump, sample injection, valve, filter, dispenser, mixer, reactor, separator, cell lysis under electric field, transducer and etc

Clinical diagnostics Clinical diagnostics

- Early cancer diagnostics

Tissue engineering and biomaterials

- Bioreactor for tissue engineering, cell culture, fermentation, extraction, manufacturing of protein, pure plasmid DNA and etc; microreactor

## Biomedical devices

- Tissue cutting: Micro thrombectomy catheter for clot breakup in cardiovascular system, such as acute ischemic stroke, hemodialysis arterio-venous (AV) grafts and fistulae, tissue cutting and etc
- Drug delivery: Pulmonary drug delivery.

## Experimental measurement

- Far-field nanoscopic nanovelocimeter, thermometer and fluorescence spectroscopy for nanofluidics and near wall flow
- Stimulation emission depletion
- Velocimetry based on laser-induced fluorescence photobleaching for microfluidics

## Fluid and Biofluid mechanics

- Applying modern flow control and receptivity to study biofluid mechanics and application in life science
- Fluid dynamics, turbulence, heat and mass transfer enhancement

## PUBLICATIONS

### Book

Wang, G. R. (2000) Turbulent mixing, stability and secondary flow in a confined configuration. Wissenschaftliche Schriftenreihe Stroemungstechnik, Bd. 8. ISBN 3-89574-376-3, Verlag Dr. Koester.

### Patents

- 1 Wang; G; Sundaram, S; Pant, K; Feng J, P. Storm (2006) MEMS based microcatheter for thrombectomy. Submitted to US patent (pending).
- 2 Krishnamoorthy, S.; G **Wang**; Feng J. (2006) Travelling wave electrothermal pump. Submitted to US patent (pending)
- 3 Feng, J. J.; Guiren **Wang**, Kapil Pant, Shankar Sundaram (2005) Method and Apparatus for Separating Particles by Dielectrophoresis. Submitted to US Patent, 11/167428 (Pending).
- 4 Wang, G. R.; Jiang, H. (2007) Method and Apparatus for fluid velocity measurement based on photobleaching. US patent, 7283215B2.
- 5 Pant, K; G **Wang**; JJ Feng; S. Krishnamoorthy; S. Sundaram (2005) Electrostatic sampler and method. Submitted to US Patent 7428848.
- 6 Fiedler, H. E.; **Wang**, G. R. (1998a) A new process for rapid and homogeneous mixing of fluids in continuous operations (in German). Deutsches Patent No. 19816354.1.
- 7 Fiedler, H. E.; **Wang**, G. R. (1998b) Anemometer based on the effect of photobleaching (in German). Deutsches Patent. No. 19838344.4.
- 8 Fiedler, H. E.; **Wang**, G. R. (1998c) Efficient heat exchanger through confined symmetric and asymmetric wakes in a pipe (in German). Deutsches Patent. No. 19850190.0.

### Journals

1. C. Kuang, W. Zhao, G. **Wang** Far-field optical nanoscopy based on continuous wave laser stimulated emission depletion. *Review of Scientific Instruments* 81, 053709, (2010)
2. M. Yakut Ali, C. Kuang, J. Khan, G.R. **Wang**, A Dynamic Piezoelectric Micropumping Phenomenon. *Microfluidics and nanofluidics*, 9:385–396, (2009).
3. F. Yang, X. Yang, H. Jiang, P. Bulkhaults, P. Wood, W. Hrushesky, G.R. **Wang**, Dielectrophoresis Separation of Colorectal Cancer Cells. , 4, 013204 (2010).
4. C. Kuang, **G. Wang** A novel far-field nanoscopic velocimetry for nanofluidics. *Lab-on-a-Chip*. 10, 240–245, (2010).
5. Kuang, CF; Zhao, W; Yang, F. and **Wang**, G. (2009) The risetime of electroosmotic flow in microchannels. *Analytical Chemistry*. 81, 6590–6595.
6. Wang, Y; Pant, K.; Chen, Z.; **Wang**, G.; Diffey, WF; Ashley, P. Shivshankar Sundaram (2009) Numerical analysis of electrokinetic transport in micro-nanofluidic interconnect preconcentrator in hydrodynamic flow. *Microfluidics and nanofluidics*. 7:683–696.
7. Kuang, CF; Zhao, W; Yang, F. and **Wang**, G. (2009) Measuring flow velocity distribution in microchannels using molecular tracers. *Microfluidics and nanofluidics*. 7:509–517.

8. Wang, G.R; Sas, I; Jiang, H; Janzen, W.P; Hodge, C.N. (2008) Testing Microfluidic Instruments Using a Novel Method for Measuring Fluid Flow Rates. *Electrophoresis*. 29, 1253–1263.
9. Jinag, H; **Wang**, G.R. (2008) Thermocapacitive Flow Sensor. In. Li, Dongqing (ed) *Encyclopedia of Microfluidics and Nanofluidics*. 2025-2032.
10. Wang, G. R. (2006) On large structures and turbulent mixing in confined mixing layers under forcing. *AIChEJ*. 52, 111-124.
11. Wang, G. R. (2005) Laser-induced fluorescence photobleaching anemometer for microfluidic devices. *Lab on a Chip*, 5, 450 – 456.
12. Wang, G. R., Santiago, J. G., Mungal, M. G. Yang, B., & Papademetriou S., (2004) A laser induced cavitation pump. *Journal of Micromechanics and Microengineering*. 14, 1037-1046.
13. Wang, G. R. (2003) A rapid mixing process in continuous operation under periodic forcing. *Chemical Engineering Science*. 58, 4953-4963.
14. Wang, G. R.; Fiedler, H. E. (2000) On high spatial resolution scalar measurement with LIF. Part 1: Photobleaching and Thermal Blooming. *Experiments in Fluids*. 29, 257-264.
15. Wang, G. R.; Fiedler, H. E. (2000) On high spatial resolution scalar measurement with LIF. Part 2: The Noise Characteristics. *Experiments in Fluids*. 29, 265-274.
16. Dai, G. C., **Wang**, G. R., Fan, Z. H. (1989a) Transition from laminar to turbulent flow in artificially roughened pipes. *J. East China Institute of Chemical Technology*. 15, 580-584.
17. Dai, G. C., Fan, Z. H, **Wang**, G. R. (1989b) Flow resistance in repeated-rib tubes. *Ibid*, 15, 300-304.
18. Fan, Z. H, Dai, G. C., Jin, D. Y., **Wang**, G. R. (1989c) Turbulent flow in artificially roughened pipes. *Ibid*, 15, 305-312.
19. Wang, G. R; Zhang, B. G. (1984) Study of heat transfer of the horizontal immersed tubes in fluidized beds. *J. Fushun Petroleum Institute*. No. 2.

#### Submitted for publication

1. C. Kuang, R. Qiao, G. **Wang** Ultrafast Measurement of Transient Electrokinetic Flow in Microfluidics.
2. Fang Yang, Cuifang Kuang, Wei Zhao, Guiren Wang AC electrokinetic fast mixing in non-parallel microchannels.

#### Conferences papers and presentation

- 1 Y. Ali; C. Kuang; J. Kahn; G.R. Wang (2009) A Piezoelectric Micropumping Based on D31 Mode. *Bull. Am. Phys Soc. Vol 54*.
- 2 Kuang, CF, **Wang**, GR.(2009) Nano-Velocimetry for Nanofluidics. *Bull. Am. Phys Soc. Vol 54*.
- 3 G.R. Wang; C. Kuang; W. Zhao Flow Velocity Profile in a Nanocapillary. *Bull. Am. Phys Soc. Vol 54*.
- 4 W. Zhao; G. Wang (2009) A New Mechanism for Mixing Enhancement in Turbulent Mixing Layer. *Bull. Am. Phys Soc. Vol 54*.
- 5 F.Yang; X. Yang; H. Jiang; P. Wood; W. Hrushesky; GR. Wang (2009) Colon Cancer Cell Separation by Dielectrophoresis. *Bull. Am. Phys Soc. Vol 54*.
- 6 G.R Wang (2009) Ultrafast inline mixing process. AIChE Annual meeting; Nashville, TN, Nov. 8-13, 2009
- 7 C. Kuang; W. Zhao; G.R.Wang (2009) CW laser STED system for Far-field optical microscopy. National Institutes of Health Workshop on Optical Diagnostic and Biophotonic Methods from Bench to Bedside. Oct. 1 – 2, 2009, Bethesda, Maryland, USA
- 8 C. Kuang, G.R. Wang (2009) Novel ultrafast far-field nanoscopic velocimeter for lab-on-a-chip applications. Lab-on-a-Chip World Congress, San Francisco Conference Center, Aug. 6-7, 2009. (Invited talk).
- 9 F.Yang, Cuifang Kuang, Wei Zhao, Guiren Wang (2009) A new design of AC electrokinetic micromixer. 83rd ACS Colloid and Surface Science Symposium and the 13th International Conference on Surface and Colloid Science. Columbia University in New York, NY, June 14 - 19, 2009.
- 10 Kuang, CF, **Wang**, GR, (2008) Study on the rise time of electroosmotic flow in microcapillary tubes. 60th Annual Meeting of the Division of Fluid Dynamics, San Antonio, Texas. November 23–25, 2008.
- 11 J. Khan; G. R. **Wang**; D. McCants, Aly H. Shaaban (2008) Heat transfer enhancement using nanofluid and novel active flow control. The Thermal Management Materials and Sciences Workshop, 16-17, September 2008. National Composite Center (NCC), 2000 Composite Drive, Kettering, Ohio, 45420.
- 12 Wang, G.R, Jiang, H. (2008) Mixing Phenomenon in a Confined Plane Wake in a Pipe. 6th International Symposium on Mixing in Industrial Processes (ISMIP6), August 17-21, 2008, Niagara Fall, Canada.

- 13 Kapil Pant, Guiren **Wang**, Balabhaskar Prabhakarandian and Shivshankar Sundaram (2007) Electric Field Driven Lysis of Gram-Positive Bacterial Cells. The 2007 Scientific conference on chemical & biological defense research. Nov. 13-15, 2007, Timonium, Maryland, USA.
- 14 Wang, G.R.; Jiang, H. (2007) Symmetric breaking hysteresis in a plane wake. 60th Annual Meeting of the Division of Fluid Dynamics, Salt Lake City, Utah, Bull. Am. Phys Soc. Vol 52.
- 15 Guo, Junpeng.; Guiren **Wang**; David J. Brady (2006) Super-Resolution Mapping of Flow Velocity Distribution in Nanofluidic Channels. Frontiers in Optics/Laser Science XXII, The 90th Optical Society of America Annual Meeting. Oct. 8-12, 2006, Rochester, New York, USA.
- 16 Wang, G.R.; Pant, K.; Storm, P.; Feng, J.; Prabhakarandian, B.; Sundaram, S; (2006) Piezo-actuated Mechanical Thrombolysis Microcatheter for Acute Ischemic Stroke. BMES Annual Fall Meeting, Oct. 11-14, 2006, Chicago, IL.
- 17 Wang, G.R.; J. Guo; Y. Lin, J. Feng, J. Wei, Y. Wang; S. Krishnamoorthy; S. Sundaram (2006) Laser-Induced Fluorescence Photobleaching Anemometer for Flow Velocity Measurement in Sub-Microscale Fluidic Channels. IEEE Lasers and Electro-Optics Society, Summer Topical Meetings, 17 – 19 July 2006, Quebec City, QC, Canada.
- 18 Feng, J. J.; S. Krishnamoorthy, G. W. **Wang**, and S. Sundaram (2006) Simulation of Electrokinetic Flow and Analyte Transport in Nano Channels. NSTI-Nanotech, Vol. 2, 505-508, May 7-11, 2006, Boston, Massachusetts, U.S.A.
- 19 Wang; G. R.; J.J. Feng; S. Vasantgadkar; K. Pant; B. Prabhakarandian; S. Krishnamoorthy; S. Sundaram (2006) A Continuous Particle/Cell Sorter Using Dielectrophoresis. NSTI-Nanotech 2006, Vol. 2, 570-573, May 7-11, 2006, Boston, Massachusetts, U.S.A.
- 20 K. Pant, J. Feng, G. **Wang**, S. Krishnamoorthy and S. Sundaram (2004) Separation of bioparticulate matter using traveling wave dielectrophoresis. 7<sup>th</sup> International Conference on Miniaturized Chemical and Biochemical Analytical Systems, October 5-9, 2003, Squaw Valley, California USA. Pp 1207-1210.
- 21 Wang, G. R.; J. G. Santiago; M. G. Mungal (2002) Interaction between laser-induced cavitation flow and a micro tube: micro pumping effect. *Annual Thermal And Fluid Science Affiliate Conference*, Stanford, CA, Feb. 2002.
- 22 Wang, G. R.; Santiago, J. G.; Mungal, M. G. (2001) Some visualization observations of laser induced cavitation flow. *Bull. Am. Phys Soc. Vol 44*.
- 23 Wang, G. R., Fiedler, H. E. (1999e) On turbulent mixing in a confined mixing layer in a pipe. 17<sup>th</sup> Biennial North American Mixing Conference. Banff, Alberta, Canada.
- 24 Wang, G. R.; Fiedler, H. E. (1998d) A new receptivity mechanism in a confined configuration. *Bull. Am. Phys Soc. Vol 43*.
- 25 Wang, G. R.; Fiedler, H. E. (1998e) Scalar power spectral density in a confined wake in a pipe. *Bull. Am. Phys Soc. Vol 43*.
- 26 Wang, G. R.; Spieweg, R.; Fiedler, H. E. (1998f) Turbulent mixing in a confined plane wake in a pipe. *Bull. Am. Phys Soc. Vol 43*.
- 27 Wang, G. R.; Fiedler, H. E. (1998g) On high spatial resolution scalar measurement with LIF. *Bull. Am. Phys Soc. Vol 43*.
- 28 Wang, G. R.; Fiedler, H. E. (1998h) On turbulent mixing criterion. *AICHE 1998 Annual Meeting, Miami*.
- 29 Wang, G. R.; Fiedler, H. E. (1998i) A new flow for an ideal mixed reactor. *Ibid*.
- 30 Wang, G. R., Fiedler, H. E. (1997) Some new observations in a confined plane wake in a pipe. *The 2<sup>nd</sup> International Science of Fluid Mechanics and Art Conference*. Berlin.
- 31 Wang, G. R., Fiedler, H. E. (1996) Paring burst - a new phenomenon. *Bull. Am. Phys Soc. Vol 41*.

## SYNERGISTIC ACTIVITIES

- Served on NSF proposal review panels
- Served on NIH proposal review panels

## REVIEWER FOR JOURNAL

AIChE Journal  
 Biomicrofluidics  
 Electrophoresis  
 Journal of Colloid and Interface Science  
 Industrial & Engineering Chemistry Research  
 International journal of heat and mass transfer

Journal of Microelectromechanical Systems.  
Lab-on-a-Chip  
Microfluidics and nanofluidics  
Sensor and Actuator B

**INVITED PRESENTATION**

SC Johnson, Racine, WI, 2010  
Lab-on-a-Chip World Congress 2009, San Francisco, CA, USA.  
University of Alabama in Huntsville, Hudson Biotechnology Seminar Series, 2004.

**HOBBY** Tai Qi Chuan, Calligraphy