

**HO CHEUNG SHUM (Anderson)**

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**RESEARCH INTERESTS**

- Microfluidic and biomicrofluidic technologies
- Preparation, characterization and functionalization of emulsion and emulsion-templated soft materials
- Micro-scaled fluid dynamics, simulation of micro-capillary flow
- Soft condensed matter
- Biomaterials
- Drug delivery and biomedical devices

**PRESENT ACADEMIC POSITION**

**University of Hong Kong**  
Assistant Professor  
Department of Mechanical Engineering  
Medical Engineering Program

**Hong Kong, CHINA**  
December 2010-Current

**EDUCATION**

**Harvard University**  
*Doctor of Philosophy in Applied Physics*  
*Advisor: David A. Weitz*  
*S.M., Applied Physics*  
**GPA: 3.96/4.0**

**Cambridge, MA, USA**  
*November 2010*

*June 2007*

**Eindhoven University of Technology**  
*Visiting research student*

**Eindhoven, Netherlands**  
*October-November 2010*

**Princeton University**  
*Bachelor of Science & Engineering, summa cum laude*  
*Major: Chemical Engineering*  
*Minors: Materials Science and Engineering, Engineering Biology*  
GRE: Verbal 580 /79%, Quantitative 800 /92%, Analytical Writing 5.0 /71%  
**Overall GPA: 3.87/4.0 cumulative**

**Princeton, NJ, USA**  
*September 2001- June 2005*

**Departmental GPA: 3.98/4.0 cumulative**

**Imperial College, University of London**  
*Study Abroad Program*

**London, UK**  
*September 2002-June 2003*

**Li Po Chun United World College of Hong Kong**  
*Lord Wilson United World College Scholarship*

**Hong Kong, China**  
*September 1999-June 2001*

## PROFESSIONAL ACTIVITIES

- Environment Conservation Fund Research Projects Vetting Subcommittee, HKSAR Government
- Editor-in-Chief for *Soft*
- Editor for *Central European Journal of Engineering*
- Editor for *Nanoscience and Nanotechnology*
- Editor for *Nano Communications International*
- Editor for *Nanomaterials & Nanosciences*
- Guest editor for special issue of *International Journal of Nonlinear Sciences and Numerical Simulation* on “Microfluidics”
- Reviewers for
  - “*Angewandte Chemie*”,
  - “*Advanced Materials*”,
  - “*Journal of the American Chemical Society*”,
  - “*Proceedings of the National Academy of Sciences*”,
  - “*Nano Letters*”,
  - “*Scientific Reports*” by Nature Publishing Group,
  - “*Advanced Functional Materials*”,
  - “*Small*”,
  - “*Langmuir*”,
  - “*Particle & Particle Systems Characterization*”,
  - “*Chemical Engineering Journal*”,
  - “*Chemical Engineering Science*”,
  - “*Crystal Growth & Design*”,
  - “*Nanoscale Research Letters*”,
  - “*Industrial & Engineering Chemistry Research*”,
  - “*Lab on a Chip*”,
  - “*Soft Matter*”,
  - “*Nanoscale*”,
  - “*Journal of Polymer Science Part A: Polymer Chemistry*”,
  - “*Journal of Polymer Science: Polymer Physics*”,
  - “*Current Nanoscience*”,
  - “*Biomicrofluidics*”,
  - “*Chemical Communications*”,
  - “*Journal of Colloid and Interface Science*”,
  - “*Micromachines*”,
  - “*Central European Journal of Engineering*”,
  - “*Nanoscience and Nanotechnology*”,
  - “*Polymer*”,
  - “*Polymers*”,
  - “*Material Letters*”,
  - “*Microfluidics and Nanofluidics*”,
  - “*Carbohydrate Polymers*”,
  - “*Journal of Membrane Biology*”,
  - “*Journal of Biomedical Nanotechnology*”,
  - “*Molecules*”,
  - “*Colloids and Surfaces A: Physicochemical and Engineering Aspects*”,

- “*Colloids and Surfaces B: Biointerfaces*”,
  - “*RSC Advances*”,
  - “*Process Biochemistry*”,
  - “*Journal of Visualized Experiments*”,
  - “*Chinese Journal of Chemical Engineering*”, and
  - “*Progress in Colloid and Polymer Science*”.
- Reviewer for National Natural Science Foundation of China (NSFC) Proposals
- Session Chair,
  - 3rd Asia-Pacific Chemical and Biological Microfluidics Conferences (APCBM 2013). 9th World Congress of Chemical Engineering (WCCE9). Coex, Seoul, Korea (2013)
  - Advances in Bioinspired Engineering and Biomedical Engineering - Joint Scientific Symposium of The Hong Kong University of Science and Technology, Shanghai Jiao Tong University and Chiba University (JSSHSC2013), Hong Kong, 2013
  - Emulsions, Bubbles and Foams: Fundamentals and Applications, Division of Colloid and Surface Chemistry, 245<sup>th</sup> National Meeting of the American Chemical Society, New Orleans, USA, 2013
  - Session Title: Synthesis of Colloids, UK Colloids 2011
  - China Soft Matter Day, 2012
- Local Organizing Committee,
  - International Conference on Frontiers of Soft Matter Physics: from Non-equilibrium Dynamics to Active Matter, Hong Kong University of Science and Technology, Hong Kong, 2014
  - The 4th ASME Micro/Nanoscale Heat & Mass Transfer International Conference (MNHMT-13), Hong Kong, 2013
  - Advances in Bioinspired Engineering and Biomedical Engineering - Joint Scientific Symposium of The Hong Kong University of Science and Technology, Shanghai Jiao Tong University and Chiba University (JSSHSC2013), Hong Kong, 2013
  - Optofluidics 2013, Hong Kong Polytechnic University, Hong Kong, 2013

## EXPERIENCE

### Harvard University – Prof. David A. Weitz

Cambridge, MA, USA

*Graduate Student*

- Investigates the usefulness of microfluidic devices as a formulation tool for producing emulsions in a controlled fashion, in terms of the following aspects:
  - Emulsion stability
  - Encapsulation efficiency
  - Compartmentalizing capacity
- Studies the jet instabilities in multi-phase fluid flow in microfluidic devices

### Environmental Protection Department, HKSAR Government

Hong Kong

*Summer Intern, Air Modeling Group*

*July 2005-Sept 2005*

- Utilized SAS statistical package to perform clustering analyses on meteorological and air quality data in HK

- Discovered and evaluated the relationship between certain weather patterns and the corresponding air quality
- Assessed the accuracy of the numerical air quality modeling system, PATH

**Princeton University – Prof. Ilhan Aksay & Prof. Dudley Saville** **Princeton, NJ, USA**  
*Senior Thesis Student* *January 2004-June 2005*

- Investigated the corrosion inhibition mechanism of surfactants
- Designed a designer system and utilized clean room techniques for fabrication
- Gained proficiency in photolithography, e-beam & thermal evaporation, atomic force microscopy and other techniques

**Harvard University – Prof. David Weitz** **Cambridge, MA, USA**  
*Research Experience for Undergraduates* *June 2004-August 2004*

- Conducted packing, gelling and crystallization experiments using micrometer-sized ellipsoids
- Reported and presented research to faculty and student participants of the research program

**Waste & Environmental Technologies Ltd.** **Hong Kong**  
*Summer Engineering Trainee* *June 2003-August 2003*

- Produced an educational CD for Airport Authority of Hong Kong on its environmental works
- Assisted in the design of systems and prepared proposals for wastewater treatment projects in Approach Beach, Hoi Ha Wan and Kowloon Motor Bus Depot in Hong Kong
- Prepared scientific papers for submission to scientific organizations (e.g. World Filtration Conference)

**Super Camp, Proactive-Learning Ltd.** **Hong Kong**  
*Site Administrator* *June 2002-July 2002*

- Oversaw all business operations for two 2-week camps for over 200 students
- Managed all personnel (20+) and ensured effective communication with parents
- Created camp direction, inspiration, guidance, tone with Facilitators

**Technion-Israel Institute of Technology** **Haifa, Israel**  
*SciTech 2001 participant* *July 2001-August 2001*

- Researched and analyzed data for investigating the effect of noble metals on photocatalysis by titanium dioxide
- Conducted a seminar, wrote a report and won the 1<sup>st</sup> place in the poster presentation competition

**Li Po Chun United World College, Open Day Organizing Committee** **Hong Kong**  
*Co-chairperson* *May 2000-April 2001*

- Initiated and organized the first Open Day themed “Global Village” where students from over 70 countries presented their countries’ unique cultures through exhibitions, games and performances
- Led the committee and oversaw details from planning, publicity, sponsorship

## **AWARDS & HONORS**

- Early Career Award by Research Grants Council of Hong Kong, 2012
- Doris Zimmern HKU-Cambridge Hughes Hall Fellowship 2012-2013

- Engineering Overseas Visitor Programme Fellowship, 2011, 2013
- Materials Research Society Graduate Student Silver Award, Spring 2010
- Robert L. Wallace Prize Fellowship, Harvard School of Engineering and Applied Sciences (HSEAS), 2006-2007
- Notable mention, Art of Science Competition 2005, Princeton University
- Central Jersey Section, American Institute of Chemical Engineers, Award for Overall Excellence in Chemical Engineering, 2005
- Procter & Gamble (P&G) Award for Outstanding Design Project, 2005
- Ticona Award for Outstanding Senior Thesis, 2005
- Elected member of Phi Beta Kappa, the Academic Honor Society, 2005
- Elected member of Sigma Xi, the Scientific Research Society, 2005
- Elected member of Tau Beta Pi, the Engineering Honor Society, 2004
- Davis-United World Colleges (UWC) Scholarship, 2001-2005
- Outstanding Achievement Certificates in Spring 2002, Fall 2003, Spring 2004 and Fall 2004 by School of Engineering and Applied Science (SEAS) at Princeton University
- Lord Wilson United World Scholarship, 1999-2001

## PUBLICATIONS

### **Refereed Journal Articles (As of December 11, 2013, Google Scholar: 1178 citations, *h-index* of 17)**

- **“All-aqueous multiphase microfluidics”** by Yang Song, Alban Sauret, and Ho Cheung Shum\*. Accepted to *Biomicrofluidics*. (2013)
- **“Syringe-pump-induced fluctuation in all-aqueous microfluidic system – implications for flow rate accuracy”** by Zida Li, Sze Yi Mak, Alban Sauret and Ho Cheung Shum\*. Accepted to *Lab-on-a-Chip*. (2013)
- **“Engineering polymeric composite particles by emulsion-templating: Thermodynamics versus kinetics”** by Tiantian Kong, Zhou Liu, Yang Song, Liqiu Wang\*, and Ho Cheung Shum\*. *Soft Matter*, **9**, 9780-9784 (2013)
- **“Fabrication of Uniform Multi-compartment Particles Using Microfluidic Electro-spray Technology for Cell Co-culture Study”** by Z. Liu, and H.C. Shum\*. *Biomicrofluidics*, **7**, 044117 (2013)
- **“Editorial: Soft”** by Anderson Ho Cheung Shum\*. *SOFT*, **2**(2), 7 (2013)
- **“Fabrication of Ceramic Microspheres by Diffusion-Induced Sol-Gel Reaction in Double Emulsions”** by Lei Zhang, Shaochang Hao, Bing Liu, Ho Cheung Shum, Jiang Li, and Haosheng Chen\*. *ACS Applied Materials and Interfaces*, Article ASAP (2013)
- **“Microfluidic Fabrication of Polymeric Core-shell Microspheres for Controlled Release Applications”** by T.T. Kong, J. Wu, K.W.K. Yeung, M.K.T. To\*, H.C. Shum\*, and L.Q. Wang\*. Submitted to *Biomicrofluidics*, **7**, 044128 (2013)
- **“Fabrication and characterization of monodisperse PLGA-alginate core-shell microspheres with monodisperse size and homogeneous shells for controlled drug release”** by Jun Wu, Tiantian Kong, Kelvin Wai Kwok Yeung, Ho Cheung Shum\*, Kenneth Man Chee Cheung, Liqiu Wang, Michael Kai Tsun To\*. *Acta Biomaterialia*, available online (2013)
- **“Manipulation of viscous all-aqueous jets by electrical charging”** by Yang Song, Zhou Liu, Tiantian Kong and Ho Cheung Shum\*. *Chemical Communications*, **49**, 1726 (2013)

- **“Bioinspired Multifunctional Janus Particles for Droplet Manipulation”** by Yuanjin Zhao\*, Hongcheng Gu, Zhuoying Xie, Ho Cheung Shum\*, Baoping Wang, and Zhongze Gu\*, *Journal of the American Chemical Society*, **135**(1), 54 (2013)
- **“Fabrication and manipulation of polymeric magnetic particles with magnetorheological fluid”** by Jaime Rodriguez- López\*, Ho Cheung Shum\*, Luis Elvira, Francisco Montero, David A. Weitz\*, *Journal of Magnetism and Magnetic Materials*, **326**, 220 (2013)
- **"Emulsion Templating of Poly(lactic acid) Particles: Droplet Formation Behaviour"** by Goran T. Vladislavjevic, Wynter Joia Duncanson, Ho Cheung Shum and David A. Weitz\*. *Langmuir*, **28**(36), 12948 (2012)
- **"Monodisperse w/w/w double emulsion induced by phase separation"** by Yang Song and Ho Cheung Shum\*. *Langmuir*, **28**(33), 12054 (2012)
- **"Single step emulsification for the generation of multi-component double emulsions"** by L. L. A. Adams, Thomas E. Kodger, Shin-Hyun Kim, Ho Cheng Shum, Thomas Franke and David A. Weitz\*. *Soft Matter*, **8**, 10719 (2012)
- **“Fluctuation-induced dynamics of multiphase liquid jets with ultra-low interfacial tension”** by Alban Sauret, Constantinos Spandagos and Ho Cheung Shum\*. *Lab on a Chip*, **12**, 3380 (2012)
- **“Droplet based microfluidic fabrication of designer microparticles for encapsulation applications”** by Tiantian Kong Wu Jun, Michael To, Kelvin Wai Kwok Yeung, Ho Cheung Shum and Liqiu Wang. *Biomicrofluidics*, **6**, 034104 (2012)
- **“Monodisperse Gas-filled Microparticles from Reactions in Double Emulsions”** by Wynter Joia Duncanson, Alireza Abbaspourrad, Ho Cheung Shum, Shin-Hyun Kim, Laura Lavada Ann Adams, and David A Weitz. *Langmuir*, **28**, 17, 6742 (2012)
- **“Beating the jetting regime”** by Alban Sauret, and Ho Cheung Shum. *International Journal of Nonlinear Sciences and Numerical Simulation*, **13**(5), 351 (2012)
- **“Forced generation of simple and double emulsions in all-aqueous system”** by Alban Sauret, and Ho Cheung Shum\*. *Applied Physics Letters* **100**, 154106 (2012)
- **“Microfluidic fabrication of water-in-water (w-w) jets and emulsions”** by Ho Cheung Shum, Jason Varnell, and David. A. Weitz. *Biomicrofluidics* **6**, 012808 (2012)
  - *selected for the March 15, 2012 issue of Virtual Journal of Biological Physics Research*
- **"Enhanced encapsulation of actives in self-sealing microcapsules by precipitation in capsule shells"** by Yuanjin Zhao, Ho Cheung Shum, Laura L.A. Adams, Bingjie Sun, Christian Holtze, Zhongze Gu and David A. Weitz. *Langmuir*, **27** (23), 13988–13991 (2011)
- **"Multiple polymersomes for programmed release of multiple components"** by Shin-Hyun Kim, Ho Cheung Shum, Jin Woong Kim, Jun-Cheol Cho and David A. Weitz. *Journal of the American Chemical Society*, **133** (38), 15165-15171 (2011)
- **"Multicompartment polymersome gel for encapsulation"** by Ho Cheung Shum, David A. Weitz. *Soft Matter*, **7** (19) 8762-8765 (2011)
- **“Early development drug formulation on a chip: Fabrication of nanoparticles using a microfluidic spray dryer”** by J. Thiele, M. Windbergs, A. R. Abate, M. Trebbin, H.C. Shum, S. Förster, D. A. Weitz, *Lab on a Chip*, **11**, 2362-2368 (2011)
- **“Microfluidic generation of multifunctional quantum dot barcode particles”** by Yuanjin Zhao, Ho Cheung Shum, Haosheng Chen, Laura L. A. Adams, Zhongze Gu, David A. Weitz, *Journal of the American Chemical Society*, **133** (23), 8790-8793 (2011)
- **“Dewetting-induced membrane formation by adhesion of amphiphile-laden interfaces”** by Ho Cheung Shum, Enric Santanach-Carreras, jin-Woong Kim, Allen Ehrlicher, Jerome

- Bibette, and David A. Weitz, *Journal of the American Chemical Society*, **133**(12), 4420–4426 (2011)
- **"Breakup of double emulsions in constrictions"** by Haosheng Chen, Jiang Li, Ho Cheung Shum, Howard A. Stone and David A. Weitz, *Soft Matter*, **7**, 2345-2347 (2011)
  - **"Multicompartment polymersomes from double emulsions"** by Ho Cheung Shum, Yuan-jin Zhao, Shin-Hyun Kim, and David A. Weitz, *Angewandte Chemie International Edition*, **50**(7), 1648-1651 (2011)
  - **"Hierarchical porous materials made by drying complex suspensions"** by Andre R. Studart, Julia Studer, Lei Xi, Kisun Yoon, Ho Cheung Shum, and David A. Weitz, *Langmuir* **27**(3), 955-964 (2011)
  - **"Controlled buckling and crumpling of nanoparticle-coated droplets"** by Sujit S. Datta, Ho Cheung Shum, and David A. Weitz, *Langmuir*, **26**(24), 18612-18616 (2010)
  - **"Gel-Immobilized colloidal crystal shell with high thermal sensitivity"** by Toshimitsu Kanai, Daeyeon Lee, Ho Cheung Shum, Rhutesh K. Shah, and David A. Weitz, *Advanced Materials* **22**(44), 4998-5002 (2010)
  - **"Corrugated interfaces in multiphase core-annular flow"** by Ho Cheung Shum, Alban Sauret, Alberto Fernandez-Nieves, Howard A. Stone and David A. Weitz, *Physics of Fluids* **22**(8), 082002 (2010)
  - **"Fabrication of polymersomes using double emulsion templates in glass-coated stamped microfluidic devices"** by Julian Thiele, Adam R. Abate, Ho Cheung Shum, Simone Bachtler, Stephan Forster, David A. Weitz, *Small* **6**(16), 1723-1727 (2010)
  - **"Microfluidic melt emulsification for encapsulation and release of actives"** by Bingjie Sun, Ho Cheung Shum, David A. Weitz, *ACS Applied Materials & Interfaces*, **2**(12), 3411-3416 (2010)
  - **"Fabrication of tunable spherical colloidal crystals immobilized in soft hydrogels"** by Toshimitsu Kanai, Daeyeon Lee, Ho Cheung Shum, David A. Weitz, *Small* **6**(7) 807-810 (2010)
  - **"Droplet microfluidics for fabrication of non-spherical particles"** by Ho Cheung Shum, Adam R. Abate, Daeyeon Lee, Andre´ R. Studart, Baoguo Wang, Chia-Hung Chen, Julian Thiele, Rhutesh K. Shah, Amber Krummel, David A. Weitz, *Macromolecular Rapid Communications*, **31**, 108-118 (2010)
  - **"Double emulsion droplets as microreactors for synthesis of mesoporous hydroxyapatite"** by Ho Cheung Shum, Amit Bandyopadhyay, Susmita Bose and David A. Weitz, *Chemistry of Materials* **21**(22), 5548–5555 (2009)
  - **"Fabrication of monodisperse toroidal particles by polymer solidification in microfluidics"** by Baoguo Wang, Ho Cheung Shum, David A. Weitz, *ChemPhysChem* **10**, 641-645 (2009)
  - **"Arrested coalescence of particle-coated droplets into non-spherical supracolloidal structures"** by Andre Studart, Ho Cheung Shum, David Weitz, *Journal of Physical Chemistry B* **113**, 3914-3919 (2009)
  - **"Orientational order of molecular assemblies on rough surfaces"** by H.C. Schniepp, H.C. Shum, D.A. Saville and I.A. Aksay, *Journal of Physical Chemistry C* **112**, 14902-14906 (2008)
  - **"Double emulsion template monodisperse phospholipid vesicles"** by Ho Cheung Shum, Daeyeon Lee, Insun Yoon, Tom Kodger, and David A. Weitz, *Langmuir* **24**, 7651-7653 (2008)
  - **"Microfluidic fabrication of monodisperse biocompatible and biodegradable polymersomes with controlled permeability"** by Ho Cheung Shum, Jin-Woong Kim and David A. Weitz, *Journal of the American Chemical Society* **130**, 9543-9549 (2008)

- **“Colloid surfactants for emulsion stabilization”** by Jin-Woong Kim, Daeyeon Lee, Ho Cheung Shum and David A. Weitz, *Advanced Materials* **20**, 3239-3243 (2008)
- **“Designer emulsions using microfluidics”** by Rhutesh K. Shah, Ho Cheung Shum, Amy C. Rowat, Daeyeon Lee, Jeremy J. Agresti, Andrew S. Utada, Liang-Yin Chu, Jin-Woong Kim, Alberto Fernandez-Nieves, Carlos J. Martinez and David A. Weitz. *Materials Today* **11(4)**, 18-27 (2008) [Cover Article]
- **“Surfactant aggregates at rough solid-liquid interfaces”** by H.C. Schniepp, H.C. Shum, D.A. Saville, I.A. Aksay. *Journal of Physical Chemistry B.* **111**, 8707-8712 (2007)

### Conference Papers

- **“Ultrafast flow imaging by 1 um time-stretch microscopy,”** by Terence T. W. Wong, Matthew Y. H. Tang, Andy K. S. Lau, Antony C. S. Chan, Edmund Y. Lam, Kenneth K. Y. Wong, Anderson H. C. Shum, and Kevin K. Tsia, *Novel Techniques in Microscopy (NTM)*, paper NW1B.5, Kona, Hawaii, USA (2013)
- **“Engineering drug delivery vehicles with multiphase microfluidics”** by Anderson Ho Cheung Shum, Tiantian Kong, Zhou Liu and Yang Song, *ASME 2013 2<sup>nd</sup> Global Congress on Nanoengineering for Medicine & Biology*, (2013)
- **“Fabrication of uniform multi-compartment particles using electro-spray technology for cell co-culture study”** by Z. Liu and H.C. Shum, *3<sup>rd</sup> European Conference on Microfluidics*, (2012)
- **“Microfluidic fabrication of polymeric core-shell microspheres for controlled release applications”** by T. Kong, H.C. Shum and L.Q. Wang *3<sup>rd</sup> European Conference on Microfluidics*, Accepted (2012)
- **“Modulating drug release kinetics of PLGA microspheres by fabricating PLGA-alginate core-shell drug delivery devices with microfluidic method”** by J. Wu, T.T. Kong, M.K.T. To, A. Shum, L.Q. Wang and K.W.K. Yeung. *Journal of Tissue Engineering and Regenerative Medicine*, **6(SI 1)**, 327 (2012)
- **“Control over the shell thickness of core/shell drops in three-phase glass capillary devices”** by Goran T. Vladisavljevic, Ho Cheung Shum, and David A. Weitz. *Progress in Polymer and Colloid Science*, **139, VIII, 120, 115** (2012)
- **“Fabrication of biodegradable poly(lactic acid) particles in flow-focusing glass capillary devices”** by G.T. Vladisavljevic, J.V. Henry, W.J. Duncanson, H.C. Shum, and D.A. Weitz. *Progress in Polymer and Colloid Science*, **139, VIII, 120, 111** (2012)
- **“Tunable morphology of monodisperse polymer particles with microfluidics”** by Baoguo Wang, David A. Weitz, Ho Cheung Shum. *Proceedings of the 9th International Conference on Nanochannels, Microchannels, and Minichannels 2011, ICNMM2011 - 58119* (2011)
- **“Colloido-polymerosomes: capsules consisting of a composite layer of particles and polymer”** by Ho Cheung Shum. *Nanotechnology 2011- Technical Proceedings of the 2011 NSTI Nanotechnology Conference and Expo, NSTI-Nanotech 2011, 3*, 147-150 (2011)

### **PATENTS AND PATENT APPLICATIONS**

- **“Core-shell capsules for encapsulation of particles, colloids, and cells”** by Yang Song, Zhou Liu and Ho Cheung SHUM. US Provisional Patent application. *In Preparation* November 2013



- **“Stabilized all-aqueous emulsions and methods of making and using therefor”** by Yang Song and Ho Cheung SHUM. US Provisional Patent application. *In Preparation* November 2013
- **“Ophthalmological rinsing agent and method of use therefor”** by Ho Cheung Shum, Sai Hung Wong and Yau Kei Chan. US Provisional Patent application filed with the University of Hong Kong No. 61/822,219, May 2013
- **“System and method for generation of emulsions with low interfacial tension and measuring frequency vibrations in the system”** by Ho Cheung Shum, Alban Sauret, Zida Li and Yang Song. PCT and US Patent Application filed with the University of Hong Kong, PCT/CN2013/072806, 04435/002788-US1, March 2013
- **“用于制备存在于气相中的液滴的设备和方法”** by Ho Cheung Shum, and Yuanjun Liu. China Patent filed with the University of Hong Kong, 201210323200.1, September 2012
- **“System for generation of emulsions with low interfacial tension”** by Ho Cheung Shum, Alban Sauret. US Provisional Patent application filed with the University of Hong Kong No. 61/611,886, March 2012
- **“Systems and methods for shell encapsulation”** by David A. Weitz, Ho Cheung Shum, Yuanjin Zhao, Bingjie Sun, Christian Holtze. US Provisional Patent application filed with Harvard University No. 61/529,126, August 2011
- **“Melt emulsification”** by Ho Cheung Shum, Bingjie Sun, Christian Holtze, David A. Weitz. US Provisional Patent application filed with Harvard University No. 61/314,841, March 2010
- **“Systems and methods involving calcium phosphate based materials”** by Ho Cheung Shum, Amit Bandyopadhyay, Susmita Bose, David A. Weitz. International Patent application filed with Washington State University, PCT/US10/38849, June 2010
- **“Polymersomes, phospholipids and other species associated with fluidic droplets”**, by Daeyeon Lee, Jin-Woong Kim, Ho Cheung Shum, David A. Weitz and Insun Yoon. International Patent application no. PCT/US09/03389 filed with Harvard University, June 2009, and US Provisional Patent application no. 61/059163 filed with Harvard University, June 2008
- **“Emulsions and techniques for formation”**, by Liang-Yin Chu, Ho Cheung Shum, Alberto Fernandez-Nieves, Andrew Utada, Enric Santanach Carreras, David A. Weitz. Patent filed with Harvard University, IPC8 Class (AB01F308FI), USPC Class (516 54), 2009

## THESES

- **“Fabrication of functional materials in microfluidics”** by Ho Cheung Shum, Ph.D. Thesis, Harvard University, Cambridge, Massachusetts, USA (2010)
- **“An AFM study of adsorbed surfactant morphology on metals: implications for corrosion inhibition” (Thesis No. 18999)**, by Shum, Anderson Ho Cheung, Senior Thesis, Princeton University, Princeton, New Jersey, USA (2005)

## CONTRIBUTED TALKS

- **“Syringe-pump-induced disturbance in a microfluidic system with low interfacial tension”** by Zida Li, Sze Yi Mak and Ho Cheung Shum. 5<sup>th</sup> International Symposium of Microchemistry and Microsystems, Xiamen, China (2013)
- **“Encapsulation of cells in core-shell structured capsules template from all-aqueous emulsion”** by Yang Song and Ho Cheung Shum. 5<sup>th</sup> International Symposium of Microchemistry and Microsystems, Xiamen, China (2013)

- **“Microfluidic generation of all-aqueous emulsions”** by Anderson Ho Cheung Shum and Yang Song. American Chemical Society National Meeting, New Orleans, Louisiana, USA (2013)
- **“Engineering drug delivery vehicles with multiphase microfluidics”** by Anderson Ho Cheung Shum, Tiantian Kong, Zhou Liu and Yang Song. ASME 2013 2nd Global Congress on Nanoengineering for Medicine & Biology, Boston, Massachusetts, USA (2013)
- **“Fabrication of uniform multi-compartment particles using electro-spray technology for cell co-culture study”** by Z. Liu and H.C. Shum. Microfluidics Conference 2012. Heidelberg, Germany (2012)
- **“Microfluidic fabrication of polymeric core-shell microspheres for controlled release applications”** by Tiantian Kong, H.C. Shum and L.Q. Wang. Microfluidics Conference 2012. Heidelberg, Germany (2012)
- **“Fluid Dynamics in Multiphase System with Low Interfacial Tension”** by Alban Sauret and Ho Cheung Shum. The 3<sup>rd</sup> International Conference on Advances in Microfluidics and Nanofluidics (AMN 2012). Dalian, China (2012)
- **“Fabrication of biodegradable poly(lactic acid) particles in flow focusing glass capillary devices”** by G.T. Vladislavljevic, W.J. Duncanson, H. C. Shum, D.A. Weitz. UK Colloids 2011 - An International Colloid and Surface Science Symposium. Canary Wharf, London, UK (2011)
- **“Tunable Morphology of Monodisperse Polymer Particles with Microfluidics”** by Baoguo Wang, David A. Weitz & Ho Cheung Shum. ASME 9th International Conference on Nanochannels, Microchannels & Minichannels. Edmonton, Canada (2011)
- **“Colloido-Polymerosomes: capsules consisting of a composite layer of particles and polymer”** by Ho Cheung Shum. NSTI-Nanotech 2011. Boston, Massachusetts (2011)
- **“Fabrication of microcapsules with gel-immobilized colloidal crystal shells in microfluidic devices”** by Toshimitsu Kanai, Daeyeon Lee, Ho Cheung Shum, Rhutesh K. Shah, David A. Weitz. Spring Meeting of the Materials Research Society, San Francisco, California (2011)
- **“Water-based Droplet Microfluidics”** by Ho Cheung Shum, Jason Varnell and David A. Weitz. Advances in Microfluidics and Nanofluidics & Asian-Pacific International Symposium on Lab on Chip, Singapore (2011)
- **“Colloidal Particles in Nematic Droplets”** by Yoshiaky Uchida, Toshimitsu Kanai, Ho Cheung Shum and David Weitz. 23rd International Liquid Crystal Conference, Krakow, Poland (2010)
- **“Membrane Formation by Adhesion of Amphiphilic Polymer Layers”** by Ho Cheung Shum, Jerome Bibette and David Weitz. Spring Meeting of the Materials Research Society, San Francisco, California (2010)
- **“Smart Capsules: Engineering New Temperature and Pressure Sensitive Materials with Microfluidics”** by Laura Adams, James Wilking, Anderson Ho Cheung Shum, Sebastian Seiffert, Shmuel Rubinstein, Yuanjin Zhao, David Weitz. March Meeting of the American Physical Society, Portland, Oregon (2010)
- **“Attractive Amphiphilic Polymer Layers Form Amorphous Membranes”** by Ho Cheung Shum, Jerome Bibette, David Weitz. March Meeting of the American Physical Society, Portland, Oregon (2010)
- **“Assembly of Bacteria at Oil-Water Interfaces”** by Danielle Lussier, Anderson Shum, Connie Wilking. American Institute of Chemical Engineers Fall Meeting (2009)
- **“Double Emulsion Droplets as Microreactors for Synthesis of Hydroxyapatite”** by Ho Cheung Shum, Amit Bandyopadhyay, Susmita Bose and David A. Weitz. 13<sup>th</sup> International Conference on Surface and Colloid Science and 83<sup>rd</sup> ACS Colloid and Surface Science Symposium (2009)

- **“Emulsion-templated Approach for Vesicles in Microfluidics”** by Ho Cheung Shum, Jin-Woong Kim, Daeyeon Lee, Insun Yoon, David A. Weitz. Advances in Microfluidics and Nanofluidics (2009)
- **“Preparation of toroidal particles using polymer phase separation in microfluidics”** by Baoguo Wang, Ho Cheung Shum, David A. Weitz. Advances in Microfluidics and Nanofluidics, Hong Kong (2009)
- **“Fabrication of a toroidal structure of polymer particle by phase separation with one dimensional axial flow in microchannel”** by Baoguo Wang, Anderson Shum, David Weitz. 82<sup>nd</sup> ACS Colloid & Surface Science, North Carolina State University (2008)
- **“Shape transition of polymer particles made in microchannel”** by Baoguo Wang, Anderson Shum, David Weitz. 35<sup>th</sup> New England Complex Fluids Workshop, University of Rhode Island (2008)
- **“Fabrication of non-spherical polymer particles using one dimensional laminar flow in microfluidic device”** by Baoguo Wang, Anderson Shum, David Weitz. 34<sup>th</sup> New England Complex Fluids Workshop, Yale University (2008)
- **“Microfluidic fabrication of bio-compatible vesicles from double emulsions in microfluidics”** by Ho Cheung Shum, Jinwoong Kim, Daeyeon Lee and David Weitz. March Meeting of the American Physical Society, New Orleans, LA (2008)
- **“Fabrication of phospholipid vesicles from double emulsions in microfluidics”** by Insun Yoon, Anderson H. Shum, Daeyeon Lee and David A. Weitz. March Meeting of the American Physical Society, New Orleans, LA (2008)
- **“Self-organization of surfactant aggregates on rough and smooth surfaces”** by Hannes C. Schneipp, Ho C. Shum, Dudley A. Saville and Ilhan A. Aksay. March Meeting of the American Physical Society, Denver, CO (2007)
- **“Droplet-induced corrugations in microcapillary flow with low interfacial tension”** by Ho C. Shum, Alberto Fernandez-Nieves, Howard A. Stone and David A. Weitz. 29<sup>th</sup> New England Complex Fluids Workshop, Harvard University (2006)
- **“Studying surfactant aggregates on metals by atomic force microscopy”** by Hannes C. Schneipp, Ho C. Shum, Dudley A. Saville and Ilhan A. Aksay. AIChE Meeting, Cincinnati, OH (2005)

## INVITED TALKS

- **“Liquid Manipulation with Multiphase Microfluidics”** by Anderson Shum. Guangzhou Institute of Advanced Technology, Nansha, Guangdong, China (2013)
- **“Interfaces in Multiphase Micro-Flow: from Understanding to Applications”** by Anderson H.C. Shum. Mechanical Engineering Seminar, Hong Kong University of Science and Technology, Hong Kong (2013)
- **“Fluid dynamics at passive water-water interfaces”** by Anderson Shum. 1<sup>st</sup> Nanoscale Fluid Mechanics and Interfacial Water Workshop, Singapore (2013)
- **“All-aqueous Multiphase Formulations”** by Anderson Ho Cheung Shum. BASF Open Innovation Center, Pudong, Shanghai, China (2013)
- **“Biomedical Applications of Multiphase Systems”** by Anderson Ho Cheung Shum. Distinguished Lecture on Microelectronic, State Key Laboratory of Analog and Mixed-Signal VLSI, University of Macau, Macau (2013)
- **“Complex functional materials through multiphase templating”** by Anderson Ho Cheung Shum. The International Symposium on New Rising Technologies for Cosmetics-New

Cosmetics from Microfluidics. Amore-Pacific R&D Center, Mizium DongBak Hall, Korea (2013)

- **“All-aqueous Microfluidics: A Platform for Fabricating Biomaterials”** by Ho Cheung Shum. 3<sup>rd</sup> Asia-Pacific Chemical and Biological Microfluidics Conferences (APCBM 2013). 9<sup>th</sup> World Congress of Chemical Engineering (WCCE9). Coex, Seoul, Korea (2013)
- **“All-aqueous Multiphase Microfluidics”** by Anderson Shum. Optofluidics 2013. Hong Kong Polytechnic University, Hong Kong (2013)
- **“Passive interfaces for detecting minute fluidic fluctuations”** by Anderson Shum. 2<sup>nd</sup> China Soft Matter Day. Hefei, Anhui, China (2013)
- **“Works in the HKU Microfluidics and Soft Matter group”** by Anderson Shum. Laboratoire Colloïdes et Matériaux Divisés: LCMD. ESPCI Paristech (2013)
- **“All-aqueous microfluidics as a tool for functional materials”** by Anderson Shum. 7<sup>th</sup> International Conference on Materials for Advanced Technologies ICMAT 2013. Singapore (2013)
- **“All-aqueous multiphase microfluidics as a biomimetic platform for materials engineering”** by Anderson Shum. ETH Zurich, Zurich, Switzerland (2013)
- **“All-aqueous Multiphase Microfluidics- Fundamentals and Potential for Food Applications”** by Anderson Shum. Friesland Campina, Deventer, Netherlands (2013)
- **“All-aqueous Multiphase Microfluidics- Fundamentals and Biomedical Applications”** by Anderson Shum. Joint Scientific Symposium of the Hong Kong University of Science and Technology, Shanghai Jiao Tong University and Chiba University (JSSHSC 2013), Hong Kong University of Science and Technology, Hong Kong (2013)
- **“All-aqueous Microfluidics for Fabricating Bio-Materials”** by Ho Cheung Shum. Academia Sinica, Taipei, Taiwan (2013)
- **“Multiphase Microfluidics for Biomedical Applications”** by Ho Cheung Shum. Workshop on Droplet Dynamics and Interfacial Physics in Micro Devices, National Taiwan University, Taipei, Taiwan (2013)
- **“Complex Functional Soft Materials with Microfluidics”** by Ho Cheung Shum. International Conference for Leading and Young Materials Scientists (IC-LYMS 2012). Zhuhai, China (2012)
- **“All-aqueous Multi-phase Microfluidics”** by Anderson Shum. China Soft Matter Day, Guangdong University of Technology, Guangzhou, China (2012)
- **“Multiphase microfluidics for fabricating complex particles”** by Anderson Shum. Institute of Complex Molecular Systems, Eindhoven University of Technology, Eindhoven, Netherlands (2012)
- **“Multi-phase microfluidics- Opportunities in biomedical engineering”** by Anderson Shum. National Center for Nanoscience and Technology, Chinese Academy of Sciences, Beijing, China (2012)
- **“Multi-phase microfluidics”** by Anderson Shum. Department of Thermal Science and Energy Engineering, University of Science and Technology of China, Hefei, China (2012)
- **“Multi-phase microfluidics- Opportunities in biomedical engineering”** by Anderson Shum. Department of Biology and Chemistry, City University of Hong Kong, Hong Kong (2012)
- **“Multi-phase microfluidics- Opportunities in biomedical engineering”** by Anderson Shum. Department of Biology and Chemistry, City University of Hong Kong, Hong Kong (2012)
- **“Multi-phase microfluidics- a platform technology for functional materials, bio-formulations and drug delivery”** by Anderson Shum. School of Chemical Engineering, Tsinghua University, Beijing, China (2011)

- “Multi-phase microfluidics- opportunities for food, cosmetics, textiles, pharmaceuticals and drug delivery” by Anderson Shum. School of Chemical Engineering, Sichuan University, Chengdu, Sichuan, China (2011)
- “**Complex fluids in simple life**” by Anderson Shum. Meeting of Minds (MOM) Lecture, Chongqing Nankai Middle School, Chongqing, China (2011)
- “**Manipulating fluids for fabricating functional materials**” by Anderson Shum. UK Colloids 2011 - An International Colloid and Surface Science Symposium. Canary Wharf, London, UK (2011)
- “**Droplet microfluidics- Opportunities for Biomaterials, Tissue Engineering and Cell Studies**” by Anderson Ho Cheung Shum. Khademhosseini Group. Harvard Medical School & Brigham and Women’s Hospital, Cambridge, Massachusetts, USA (2011)
- “**Droplet microfluidics – Emerging platform for formulation**” by Anderson Ho Cheung Shum. School of Chemical and Material Engineering, Jiangnan University, Wuxi, China (2011)
- “**Droplet microfluidics – Emerging platform for formulation**” by Anderson Ho Cheung Shum. BASF Pudong site, Shanghai, China (2011)
- “**Fabricating functional material structures with droplet microfluidics**” by Anderson Ho Cheung Shum. Advanced Seminars in Orthopaedic Research, Medical School of University of Hong Kong (HKU), Sassoon Road, Hong Kong (2011)
- “**Fabricating functional material structures with droplet microfluidics**” by Anderson Ho Cheung Shum. Physics Colloquium of Hong Kong University of Science and Technology (HKUST), Clear Water Bay, Hong Kong (2011)
- “**Membrane Formation by Adhesion of Amphiphilic Polymer Layers**” by Ho Cheung Shum, Jerome Bibette and David Weitz. Graduate Student Award Session of Spring Meeting of the Materials Research Society, San Francisco, California (2010)
- “**Droplet microfluidics for fabrication of functional materials**” by Anderson Shum, Molecular Science and Technology, Eindhoven University of Technology, the Netherlands (2010)
- “**Microfluidics for fabrication of functional materials**” by Anderson Shum, Department of Mechanical Engineering, University of Hong Kong, Hong Kong (2010)
- “**Double emulsion droplets for material synthesis**” by Anderson Shum. UNM-Harvard PREM Workshop, Harvard University, Cambridge, Massachusetts, USA (2009)
- “**Microfluidics as a tool for particle fabrication**” by Anderson Shum, David A. Weitz. UNM-Harvard PREM Workshop, University of New Mexico, Albuquerque, New Mexico, USA (2008)
- “**Microfluidics as a formulation tool – designer emulsions**” by Anderson Shum, David A. Weitz. BASF-SE GVC Meeting, BASF-SE, Ludwigshafen, Germany (2008)
- “**Microfluidics as a formulation tool**” by Anderson Shum, David A. Weitz. BASF-AG Formulations Group Meeting, BASF-AG, Ludwigshafen, Germany (2007)

## POSTERS

- “**Dynamics of Oppositely Charged Emulsion Droplets**” by Zhou Liu, Hans M. Wyss, and Ho Cheung Shum. Gordon Research Conference- Nano-mechanical Interfaces. Hong Kong. (2013)
- “**Shielding the electrical field to prevent coalescence in microfluidics**” by Jingmei Li, and Anderson Shum. Gordon Research Conference- Nano-mechanical Interfaces. Hong Kong. (2013)
- “**Cooling-Triggered Release from Thermo-sensitive Hydrogel Capsules**” by Matthew Y.H. Tang, and Anderson H.C. Shum. Gordon Research Conference- Nano-mechanical Interfaces. Hong Kong. (2013)

- **“Capillary Micromechanics for Core-Shell Particles”** by Tiantian Kong, Liqiu Wang, Hans M. Wyss, and Ho Cheung Shum. Gordon Research Conference- Nano-mechanical Interfaces. Hong Kong. (2013)
- **“Manipulation of viscous all-aqueous jet by electrical charging”** by Yang Song, Ho Cheung Shum. Gordon Research Conference- Nano-mechanical Interfaces. Hong Kong. (2013)
- **“All-aqueous Multiphase Microfluidics”** by Yang Song, Alban Sauret, Zida Li, Sibyl Mak and Anderson H.C. Shum. Gordon Research Conference- Nano-mechanical Interfaces. Hong Kong. (2013)
- **“Manipulation of viscous all-aqueous jet by electrical charging”** by Yang Song, Ho Cheung Shum. UK society for Biomaterials Conference. Birmingham, UK (2013)
- **“To Develop a New Surgical Strategy for Removing Emulsified Droplets in the Eye to Reduce the Complications Associated the Use of Silicone Oil “SO””** by Y.K. Chan, Y.H.K. Yeung, H.C. Shum, and D. Wong. Annual Meeting of the Association for Research in Vision and Ophthalmology (ARVO). Seattle, Washington, USA (2013)
- **“An Intraocular rinsing agent to reduce the complications associated to the use of silicone oil as the vitreous substitute”** by Y.K. Chan, H.C. Shum, and D. Wong. 8<sup>th</sup> International Symposium on Healthy Aging, University of Hong Kong, Hong Kong (2013)
- **“Microfluidic Fabrication of Materials by Using All-Aqueous Emulsion as Templates”** by Yang Song and Ho Cheung Shum. The 3<sup>rd</sup> International Conference on Advances in Microfluidics and Nanofluidics (AMN 2012). Dalian, China (2012)
- **“Control over the shell thickness of core/shell drops in three-phase glass capillary devices”** by Goran T. Vladislavljevic, Ho Cheung Shum, David A. Weitz. UK Colloids 2011 - An International Colloid and Surface Science Symposium. Canary Wharf, London, UK (2011)
- **“Microfluidic preparation of multiple polymersomes using multiple emulsion droplets”** by Shin-Hyun Kim, Ho Cheung Shum, Jin-Woong Kim, and David A. Weitz. MRS Fall Meeting, Boston, MA (2010)
- **“Assembly of bacteria at oil-water interfaces”** by Danielle Lussier, Anderson Shum and Connie Wilking. AIChE meeting, Nashville TN (2008)
- **“Template-directed assembly of amphiphiles in controlled emulsions by microfluidics”** by Ho Cheung Shum, Daeyeon Lee, Jinwoong Kim, David A. Weitz. 82<sup>nd</sup> ACS Colloid & Surface Science Symposium, North Carolina State University, Raleigh NC (2008)
- **“Microfluidics as a formulation tool”** by Anderson H.C. Shum, Jin-woong Kim, Daeyeon Lee, Insun Yoon, David A. Weitz. BASF Summer School Forum, BASF AG, Ludwigshafen, Germany (2007)
- **“Microfluidics as a formulation tool”** by Anderson Ho C. Shum, Carlos J. Martinez, Alberto Fernandez-Nieves, David A. Weitz. BASF Postdoc Forum, Raleigh NC (2006)
- **“Fabrication of micron-scaled monodisperse oil-in-water emulsions in glass microcapillaries”** by A.H.C. Shum, E. Santanach Carreras, J. Bibette, D.A. Weitz. Industry Partnership Workshop: New Concepts in Microfluidics: Theory and Application, Harvard University MA (2007)