James Wang – Curriculum Vitae
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University of California, San Diego
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EDUCATION

B.S. in Bioengineering (2002-2006)	University of Washington
M.S. in Nanoengineering (2012 – 2013)	University of California San Diego
Ph.D. in Chemical Engineering (2013 – 2017)	University of California San Diego

RESEARCH INTERESTS

Cancer Therapy and Diagnostics with Nanoparticles
Ultrasound Diagnostics and Therapeutic Platforms
Nanoparticle Synthesis and Development for Medical Imaging (Ultrasound, MRI)
Drug Delivery and Controlled Release for Macular Degeneration
Synthesis of Size-Controllable Metal Core-Shell Nanoparticles and Analysis
MRI Analysis on Cerebral Structural Difference for Gender Dimorphism and Autism
Microfluidics Development with Biomolecules for Mathematical Modeling

Awards

1. Cancer Research in Nanotechnology Fellowship; 2013
2. Outstanding Poster Award; National Cancer Institute for Alliance in Nanotechnology; 2014

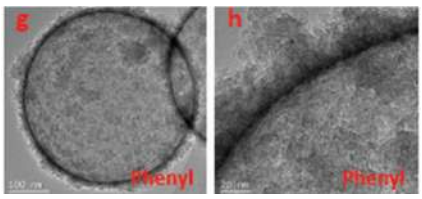
PUBLICATIONS

1. A Forcemeter Array Assembled from Microtubules and the Motor Protein Kinesin; *Journal of Undergraduate Research in Bioengineering*; 2004; **J. Wang** and H. Hess

2. Sensing of Ethanol with Nanosize Fe-ZnO Thin Film; *Journal of Nanomaterials*; 2009; G.H. Kuo, H.P. Wang, H.H. Hsu, **J. Wang**, Y.M. Chiu, C.J.G. Jou, T.F. Hsu, and F.L. Chen

3. Sensing of Zinc-Containing Nanopollutants with an Ionic Liquid; *Journal of Nanomaterials*; 2010; M. Wang, **J. Wang**, H.C. Wang, H.L. Huang, H.L. Liu

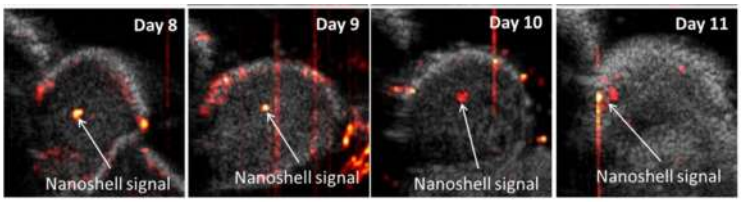
Mechanically Tunable Hollow Silica Ultrathin Nanoshells for Ultrasound Contrast Agents; ***Advanced Functional Materials***; 2015
A. Liberman*, **James Wang***, N. Lu, Robert D. Viveros, C. A. Allen, R. F. Mattrey, S. L. Blair, W. C. Trogler, M. J. Kim and A. C. Kummel
* Co-first author



Perfluoropentane (PFP) gas-filled biodegradable iron-doped silica nanoshells have been demonstrated as long-lived ultrasound contrast agents. Nanoshells are synthesized by a sol–gel process with tetramethyl orthosilicate (TMOS) and iron ethoxide. Substituting a fraction of the TMOS with R-substituted-trialkoxysilanes produces ultrathin nanoshells with varying shell thicknesses and morphologies composed of fused nanoflakes. The ultrathin nanoshells have continuous ultrasound Doppler imaging lifetimes exceeding 3 h, are twice as bright using contrast-specific imaging, and have decreased pressure thresholds compared to control nanoshells synthesized with just TMOS. Transmission electron microscopy shows that the R-group-substituted trialkoxysilanes can reduce the mechanically critical nanoshell layer to 1.4 nm. These ultrathin nanoshells have the mechanical behavior of weakly linked nanoflakes but the chemical stability of silica. The synthesis can be adapted for general fabrication of 3D nanostructures composed of nanoflakes, which have thicknesses from 1.4 to 3.8 nm and diameters from 2 to 23 nm.

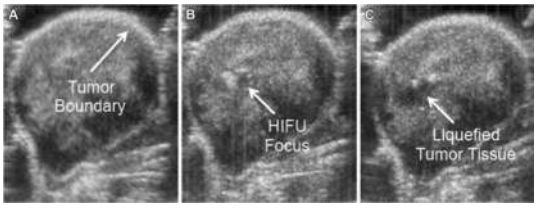
Extended Lifetime Pulse Stimulated Tumor Detection Ultrasound Imaging; ***Advanced Healthcare Materials*** (Submitted, 2015)
J. Wang, A. Liberman, C.V. Barback, C.N. Ta, R.F. Mattrey, S.L. Blair, W.C. Trogler, H. Lee, D. Vera, and A.C. Kummel

Abstract
An on-demand long-lived ultrasound contrast agent that can be activated with single pulse stimulated imaging (SPSI) has been developed using hard shell liquid perfluoropentane filled silica 500 nm nanoparticles for contrast specific tumor ultrasound imaging. SPSI was tested on LnCAP prostate tumor models in mice; tumor localization was observed after intravenous (IV) injection of the contrast agent. Consistent with enhanced permeability and retention, the silica nanoparticles displayed an extended imaging lifetime of 3.3 ± 1 days (mean ± standard deviation). With added tumor specific folate targeting, the useful lifetime was extended to 12 ± 2 days. The current study demonstrates for the first time that IV injected targeted silica contrast agents can be imaged with an in vivo lifetime 2 orders of magnitude longer than current microbubble-based contrast agents. Such targeted long-lived contrast agents may lead to new applications in tumor monitoring and therapy.



Hollow Iron-Silica Nanoshells for Enhanced High Intensity Focused Ultrasound; ***Journal of Surgical Research***; 2014
A. Liberman, Z. Wu, C.V. Barback, R.D. Viverosc, **J. Wang**, L.G. Ellies, R.F. Mattrey, W.C. Trogler, A.C. Kummel, and S.L. Blair

Abstract
High intensity-focused ultrasound (HIFU) is an alterative ablative technique currently being investigated for local treatment of breast cancer and fibroadenomas. Current HIFU therapies require concurrent magnetic resonance imaging monitoring. Biodegradable 500 nm perfluoropentane-filled iron-silica nanoshells have been synthesized as a sensitizing agent for HIFU therapies, which aid both mechanical and thermal ablation of tissues. In low duty cycle high-intensity applications, rapid tissue damage occurs from mechanical rather than thermal effects, which can be monitored closely by ultrasound obviating the need for concurrent magnetic resonance imaging.
Iron-silica nanoshells were synthesized by a sol-gel method on polystyrene templates and calcined to yield hollow nanoshells. The nanoshells were filled with perfluoropentane and injected directly into excised human breast tumor, and intravenously (IV) into healthy rabbits and Py8119 tumor-bearing athymic nude mice. HIFU was applied at 1.1 MHz and 3.5 MPa at a 2% duty cycle to achieve mechanical ablation.
Ex vivo in excised rabbit livers, the time to visually observable damage with HIFU was 20 s without nanoshells and only 2 s with nanoshells administered IV before sacrifice. Nanoshells administered IV into nude mice with xenograft tumors were activated in vivo by HIFU 24 h after administration. In this xenograft model, applied HIFU resulted in a 13.6 ± 6.1 mm3 bubble cloud with the IV injected particles and no bubble cloud without particles.



Patent

A. Liberman, A. Kummel, **J. Wang**, S.L. Blair and W.C. Trogler "Ultrasound Imaging Apparatus and Controlling Method of the Ultrasound Imaging Apparatus", Patent #: PSA14-0022-US0; 2015

Conference Presentations

1. The 3rd Mary Gates Research Symposium 2004: *A Forcemeter Array Assembled from Microtubules and the Motor Protein Kinesin*
2. The 5th Mary Gates Research Symposium 2006: *Sexual Dimorphism in Brain Structure – A Possible Relation to Autism*
3. Proceedings of the 2007 Molecular Environment International Symposium: *Sensing of Nanopollutants with an Ionic Liquid*

4. 6th International Conference on Materials Processing for Properties and Performance (MP^3 – 2007) at Beijing: *Sensing of CCl_4 with Nanosize ZnO Thin Films*

5. Mechanically Optimized Fe (III) Doped Hollow Silica Nanoshells as a Contrast Agent for Ultrasound Imaging and HIFU Therapy, *American Vacuum Society*; 2014, Oral Presentation
6. Targeted Ultrathin Silica Nanoshells for Persistent LnCAP Prostate Tumor Ultrasound Imaging in Mice, *National Cancer Institute PI Meeting*; 2014, Poster Presentation, **Outstanding Poster Presentation Award**
7. Targeted Ultrathin Silica Nanoshells for Continuous In Vivo LnCAP Prostate Tumor Marking in Mice, *Materials Research and Society*; 2015 Spring, Oral Presentation
8. Targeted Ultrathin Silica Nanoshells as HIFU Sensitizing Agents for In Vivo LnCAP Prostate Tumor Removal, *American Vacuum Society*; 2015, Oral Presentation
9. Multifunctional Silica Nanoparticles for MR Imaging and High Intensity Ultrasound Ablation, *Materials Research and Society*, 2015 Fall, Oral Presentation

Academic and Career Development

I have has been actively presenting his research via poster and oral presentations in various national research conferences during his graduate career. IN my graduate career, I have authored one patent, co-authored on one publication and have one first author publications. I am in the process of submitted a second first author publication (Stimulated Ultrasound Imaging with Silica Nanoshells) to *Advanced Healthcare Materials*. At present, I am working with University of Chicago to develop multi-functioning nanoshells and is expect to apply for NIH F31 by the end of 2015 on this topic as well as publish the results by the mid-2016. I am planning to take the pre-qualifying and qualifying exams by June, 2016 and expect to meet departmental requirements to obtain a Ph.D in 2017. My research will be closely mentored by staff scientists and post-docs in the Kummel and Trogler lab as well as faculty members. My long term goal is to seek a career in the academia and his training aims to stimulate his creativity in rigorous scientific research and design.