



Qingzhen Hao

Linkedin Profile

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Education:

Ph.D. Physics, 2006 - 2012 (expected in May), The Pennsylvania State University, GPA 3.77/4

B.Sc. Applied Physics, 2003 - 2006, Hong Kong Baptist University, Hong Kong, GPA 3.92/4

Professional Experience:

2009-present, Research Assistant, co-advisor: Dr. Vincent Crespi, Physics, and co-advisor: Dr. Tony Jun Huang, Engineering Science and Mechanics

2006-2009, Research Assistant, advisor: Dr. Peter Eklund (deceased), Physics

Research Experience (17 Journal Publications):

- Material engineering, nanofabrication, device integration and characterization/test.
- Photonics (active plasmonics, optoelectronics, and biochemical sensing)
- Graphene CVD synthesis, FET-device, electrical characterization, and sensing.
- Surface-enhanced Raman Spectroscopy (SERS)

Technical Expertise:

Nano/Micro Fabrication (Five-year Clean Room Experience): E-beam lithography, Focus ion beam milling/deposition, Nano-imprint lithography, Nanosphere lithography, Photolithography, Thin film deposition (PVD), Plasma RIE etching (CCP, ICP, MERIE), Deep RIE Si Processing, Wet etching.

Characterization/Testing Techniques: Ellipsometry, Electrical transport measurement, FE-SEM, AFM, TEM, Surface-enhanced Raman Spectroscopy, UV-visible Spectroscopy, FTIR Spectroscopy, Dark Field Microscopy, and Photoluminescence Spectroscopy.

Simulation and Software: Finite-difference Time-domain (FDTD), MATLAB, Labview, L-edit, Origin Pro, Image J and etc.

Familiar with microfluidics; understand theory and data analysis: XRD, EDS, EELS, XPS and etc

Highlights of Accomplished Projects:

- Developed a novel dual fabrication process to produce complementary metal/dielectric nanostructures simultaneously (~ 100 nm in size) and studied their properties for photonic and SERS applications—Four publications.
- Synthesized large-scale graphene by chemical vapor deposition (CVD), integrated it onto nanostructured SERS substrates and greatly improved the SERS performance—One manuscript.
- Fabricated field effect graphene devices and demonstrated, for the first time, electric modulated optical signal (Raman intensity) of methylene blue molecules—One manuscript in preparation.
- Demonstrated electric-controlled optical switches based on frequency responsive liquid crystals integrated with plasmonic nanoparticle or nanohole arrays for optoelectronic applications—Three publications.
- Conducted comparative study between Pt and Au nanostructures and revealed the physical reason for the poor SERS enhancement from transition metals—One publication.

Selected Media Coverage on My Research:

1. “A Frequency-Addressed Plasmonic Switch Based on Dual-Frequency Liquid Crystal” was featured as **Cover article** and **one of top 20 most-downloaded (monthly) articles** of Applied Physics Letters, 2010.
2. “Characterization of Complementary Patterned Metallic Membranes Produced Simultaneously by a Dual Fabrication Process” was featured as **Cover article** and **one of top 20 most-downloaded (monthly) articles** of Applied Physics Letters, 2010.
3. “Effects of Intrinsic Fano Interference on Surface Enhanced Raman Spectroscopy: Comparison between Platinum and Gold” was featured as **Cover article** of Journal of Physical Chemistry C, 2010.
4. “Shifts in Plasmon Resonance Due to Charging of a Nanodisk Array in Argon Plasma” is featured as **Cover article** of Applied Physics Letters, 2012 (*in press*).
5. “Surface-Enhanced Raman Scattering Study on Graphene Coated Metallic Nanostructure Substrates” is featured as **Cover article** of Journal of Physical Chemistry C, 2012 (*in press*).



Awards and Honors:

Rustum and Della Roy Innovation in Materials Research Award (USD --)	2011-2012
Duncan fellowship (USD 975, 550)	2008-2010
UGC Scholarship Scheme for Outstanding Mainland Students (HKD100, 000, each year)	2003-2006
Madam K.S. Fung Wu Memorial Scholarship (HKD 5,000, each year)	2004-2006

Selected Conference Proceedings and Presentations

1. Q. Hao, *et al.*, Linear optical and surface enhanced Raman scattering studies on metallic membranes with complementary patterns, APS March meeting, Dallas, TX, 2011. (Oral presentation)
2. Q. Hao, *et al.*, Surface enhanced Raman Spectroscopy (SERS) of pyridine on Pt, APS March meeting, Pittsburg, PA, 2009. (Oral presentation)
3. Q. Hao, *et al.*, “Graphene Coated Metallic Nanostructures: an Improved Surface-Enhanced Raman Scattering Substrate”, MRS Fall meeting, Boston, MA, 2011 (Oral presentation)
4. Q. Hao, *et al.*, “Experimental and Theoretical Investigation on SERS Enhancement Mechanism of Graphene”, APS March meeting, Boston, MA, 2012 (Oral presentation scheduled)
5. B. Wang, *et al.*, Chemical vapor deposition of high quality graphene on copper APS, March meeting, Portland, OR, 2010. (Oral presentation)
6. B. Wang, *et al.*, Photoluminescence (PL) from graphite monofluoride (CFn), APS March meeting, Portland, OR, 2010. (Oral presentation)

Leadership/Service:

Member of American Physical Society (APS)

Member of Materials Research Society (MRS)

Mentored two junior graduate students on various project related to plasmonics.

Peer-Reviewed Journal Publications:

1. Q. Hao, Y. Zeng, B. K. Juluri, X. Wang, B. Kiraly, I. Chiang, L. Jensen, D. H. Werner, V. Crespi, and T. J. Huang, Metallic membranes with subwavelength complementary patterns: distinct substrates for surface enhanced Raman scattering, *ACS Nano*, **5**, 5472 (2011).
2. Q. Hao, Y. Zhao, B. K. Juluri, B. Kiraly and T. J. Huang, Frequency-addressed tunable transmission in metallic nanohole arrays with dual-frequency liquid crystals, *Journal of Applied Physics*, **109**, 084340, (2011)
3. Y. J. Liu, * Q. Hao, * J. S. T. Smalley, J. Liou, I. C. Khoo, and T. J. Huang, A Frequency-Addressed Plasmonic Switch Based on Dual-Frequency Liquid Crystal, *Applied Physics Letters*, **97**, 091101 (2010). (* equal contributions, **cover image**)
4. Q. Hao, B. K. Juluri, Y. B. Zheng, B. Wang, I. Chiang, L. Jensen, V. Crespi, P. C. Eklund, and T. Jun Huang, Effects of Intrinsic Fano Interference on Surface Enhanced Raman Spectroscopy: Comparison between Platinum and Gold, *Journal of Physical Chemistry C*, **114**, 18059 (2010). (**cover image**)
5. Q. Hao, Y. Zeng, X. Wang, Y. Zhao, B. Wang, I. Chiang, D. H. Werner, V. Crespi, and T. J. Huang, Characterization of Complementary Patterned Metallic Membranes Produced Simultaneously by a Dual Fabrication Process, *Applied Physics Letters*, **97**, 193101 (2010). (**cover image**)
6. Q. Hao, B. Wang, J. A. Bossard, B. Kiraly, Y. Zeng, D. H. Werner, L. Jensen, and T. J. Huang "Surface-Enhanced Raman Scattering Study on Graphene Coated Metallic Nanostructure Substrates", *Journal of Physical Chemistry C*, (2012) *in press*. (**cover image**)
7. Y. B. Zheng, Q. Hao, Y. Yang, B. Kiraly, I. Chiang, and T. J. Huang, Light-driven Artificial Molecular Machines, *Journal of Nanophotonics*, **4**, 042501 (2010). (**invited review**)
8. Y. Zhao, Q. Hao, Y. Ma, M. Lu, B. Zhang, M. Lapsley, I.C.Khoo, and T. J. Huang, Light-driven Tunable Dual-band Plasmonic Absorber Using Liquid-crystal-coated Asymmetric Nanodisk Array, *Applied Physics Letters*, (2012) *in press*.
9. B. K. Juluri, N. Chaturvedi, Q. Hao, M. Lu, D. Velego, L. Jensen, and T. J. Huang, Scalable Manufacturing of Plasmonic Nanodisk Dimers and Cusp Nanostructures using Salting-out Quenching Method and Colloidal Lithography, *ACS Nano*, **5**, 5838 (2011).
10. B. Zhang, Y. Zhao, Q. Hao, B. Kiraly, I. C. Khoo, S. Chen, and T. J. Huang, Polarization-independent dual-band infrared perfect absorber based on a metal-dielectric-metal elliptical nanodisk array, *Optical Express*, **19**, 15221 (2011).
11. N. Chaturvedi, B. K. Juluri, Q. Hao, T. J. Huang, and D. Velegol, Simple Fabrication of Snowman-like Colloids, *Journal of Colloid & Interface Science*, *in press*.
12. M. Lapsley, A. Shahravan, Q. Hao, B. K. Juluri, S. M. Giardinelli, M. Lu, Y. Zhao, T. Matsoukas, and T. J. Huang, Shifts in Plasmon Resonance Due to Charging of a Nanodisk Array in Argon Plasma, *Applied Physics Letters*, *in press*. (**cover image**)
13. J. S.T. Smalley, Y. Zhao, A. A. Nawaz, Q. Hao, Y. Ma, I. C. Khoo, and T. J. Huang, High contrast modulation of plasmonic signals using nanoscale dual-frequency liquid crystals, *Optics Express*, **19**, 15265 (2011)

14. Y. Zhao, A. A. Nawaz, S. S. Lin, Q. Hao , B. Kiraly and T. J. Huang, Nanoscale super-resolution imaging via metal-dielectric metamaterial lens system, *Journal of Physics D: Applied Physics*, **44**, 415101 (2011)
15. B. Wang, J. Sparks, H. R. Gutierrez, F. Okino, Q. Hao, Y. Tang, V. H. Crespi, J. O. Sofo and J. Zhu, Photoluminescence from nanocrystalline graphite monofluoride, *Applied Physics Letters*, **97**, 141915 (2010).
16. B. Wang, A. Gupta, J. Huang, H. Vedala, Q. Hao, V. H. Crespi, W. Choi and P. C. Eklund, Raman scattering study of the effect of bending on single-walled carbon nanotubes, *Physical Review B*, **81**, 115422 (2010)
17. Y. Zhao, S. S. Lin, A. A. Nawaz, B. Kiraly, Q. Hao, Y. Liu and T. J. Huang, Beam bending via plasmonic lenses, *Optics Express*, **18**, 23458 (2010).

References:

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