



Name: Zhen WANG
Date of birth:
Ph.D

EDUCATION

The Chinese University of Hong Kong (CUHK), Hong Kong, SAR, China	01/08/2016-31/07/2019
Ph.D. in Department of Mechanical and Automation Engineering	
Shandong University, Shandong Province, China	01/09/2012-30/06/2015
Master in Department of Physics	
Shandong University, Shandong Province, China	01/09/2008-30/06/2012
Bachelor in Department of Physics	

RESEARCH EXPERIENCE

The Chinese University of Hong Kong (CUHK), Hong Kong, SAR, China	21/10/2019-31/12/2020
Research Associate in Department of Biomedical Engineering	
The Chinese University of Hong Kong (CUHK), Hong Kong, SAR, China	06/05/2015-31/07/2016
Research Assistant in Department of Mechanical and Automation Engineering	

RESEARCH AREA AND HIGHLIGHTS

- Ultrasensitive gas detection based on cavity enhanced photoacoustic spectroscopy
- Trace gas detection technique called heterodyne phase sensitive dispersion spectroscopy for harsh environment like combustion and flame
- Development of trace gas sensor for breath analysis based on quartz-enhanced photoacoustic spectroscopy

I have been devoted in the high sensitive gas sensor development based on laser spectroscopy for more than 5 years. My current research is focused on the combination of novel techniques in physics like optical cavity, laser frequency locking and quantum sensing with gas sensor development in engineering. My largest contribution to science is the first combination of Pound-Drever-Hall technique which is common in cold atom research with photoacoustic spectroscopy, which achieved the highest sensitivity among the sensors based on photoacoustic spectroscopy. Furthermore, I have applied different spectroscopy techniques into different applications like combustion analysis, human breath analysis and vehicle emissions monitoring.

PUBLICATIONS

Main author of 6 papers and Co-author of 16 papers with total number of citations of 267 and H-index of 10.

1. Z. Wang, H. W, Y. Li, R. Kan, and W. Ren*, 'Active modulation of intracavity laser intensity with Pound-Drever-Hall locking for photoacoustic spectroscopy', Optics Letters, 45(5), 1148-1151 (2020). Citations: 0.
2. Z. Wang#, M. Yang#, L. Fu, C. Chen, R. You*, and W. Ren*, 'Rapid field measurement of ventilation rate using a quartz-enhanced photoacoustic SF₆ gas sensor', Measurement Science and Technology, 31, 085105 (2020). Citations: 0.
3. Z. Wang, Q. Wang, W. Zhang, H. Wei, Y. Li, and W. Ren*, 'Ultra-sensitive photoacoustic detection in a high-finesse cavity with Pound-Drever-Hall locking', Optics Letters, 44(8), 1924-1927 (2019). Citations: 8.
4. Z. Wang, Q. Wang, J. Y.-L. Ching, J. C.-Y. Wu, G. Zhang, and W. Ren*, 'A portable low-power QEPAS-based CO₂ isotope sensor using a fiber-coupled interband cascade laser', Sensors and Actuators B, 246, 710-715 (2017). Citations: 26.
5. Z. Wang, J. Geng, and W. Ren*, 'Quartz-Enhanced Photoacoustic Spectroscopy (QEPAS) detection of the ν_7 band of ethylene at low pressure with CO₂ interference analysis', Applied Spectroscopy, 71(8), 1834-1841 (2017). Citations: 11.
6. Z. Wang, Z. Li, and W. Ren*, 'Quartz-enhanced photoacoustic detection of ethylene using a 10.5 μ m quantum cascade laser', Optics Express, 24, 4143-4154 (2016). Citations: 32.
7. M. Raza, L. Ma, C. Yao, M. Yang, Z. Wang, Q. Wang, R. Kan, and W. Ren*, 'MHz-rate scanned-wavelength direct absorption spectroscopy using a distributed feedback diode laser at 2.3 μ m', Optics and Laser Technology, 130, 106344 (2020). Citations: 1.
8. K. Xu, X. Zhao, Z. Wang, J. Chen, T. Li, Z. Zheng*, and W. Ren*, 'Multipass-assisted dual-comb gas sensor for multi-species detection using a free-running fiber laser', Applied Physics B, 126, 39 (2020). Citations: 0.
9. L. Ma, Z. Wang, K.-P. Cheong, H. Ning, and W. Ren*, 'Mid-infrared heterodyne phase-sensitive dispersion spectroscopy in flame measurements', Proceedings of the Combustion Institute, 37(2), 1329-1336 (2019). Citations: 4.

10. M. Yang, K. Liu, L. Ma, K.-P. Cheong, **Z. Wang**, W. Ho, and W. Ren*, 'Time-resolved characterization of non-thermal plasma-assisted photocatalytic removal of nitric oxide', *Journal of Physics D*, 53(1), 01LT02 (2019). **Citations: 0.**
11. K.-P. Cheong, L. Ma, **Z. Wang**, and W. Ren*, 'Influence of line pair selection on flame tomography using infrared absorption spectroscopy', *Applied Spectroscopy*, 73(5), 529-539 (2018). **Citations: 5.**
12. C. Yao, **Z. Wang**, Q. Wang, Y. Bian, C. Chen, L. Zhang, and W. Ren*, 'Interband cascade laser absorption sensor for real-time monitoring of formaldehyde filtration by a nanofiber membrane', *Applied Optics*, 57(27), 8005-8010 (2018). **Citations: 3.**
13. L. Ma, **Z. Wang**, K.-P. Cheong, H. Ning, and W. Ren*, 'Temperature and H₂O sensing in laminar premixed flames using mid-infrared heterodyne phase-sensitive dispersion spectroscopy', *Applied Physics B*, 124:117 (2018). **Citations: 2.**
14. Q. Wang, **Z. Wang**, W. Ren*, 'Fiber-ring laser intracavity QEPAS gas sensor using a 7.2 kHz quartz tuning fork', P. Patimisco, A. Sampaolo, and V. Spagnolo, *Sensors and Actuators B*, 268, 512-518 (2018). **Citations: 17.**
15. C. Shi, D. Wang, **Z. Wang**, L. Ma, Q. Wang, K. Xu, S.-C. Chen, and W. Ren*, 'A mid-infrared fiber-coupled QEPAS nitric oxide sensor for real-time engine exhaust monitoring', *IEEE Sensors Journal*, 17(22), 7418-7424 (2017). **Citations: 7.**
16. Z. Li, **Z. Wang**, F. Yang, W. Jin, and W. Ren*, 'Mid-infrared fiber-optic photothermal interferometry', *Optics Letters*, 42(18), 3718-3721 (2017). **Citations: 15.**
17. Q. Wang, **Z. Wang**, and W. Ren*, 'Theoretical and experimental investigation of fiber-ring laser intracavity photoacoustic spectroscopy (FLI-PAS) for acetylene detection', *Journal of Lightwave Technology*, 35(20), 4519-4525 (2017). **Citations: 10.**
18. M. Chen, H. Lu, N.M. Abdelazim, Y. Zhu, **Z. Wang**, W. Ren, S.V. Kershaw*, A.L. Rogach, and N. Zhao*, 'Mercury telluride quantum dot based phototransistor enabling high sensitivity room temperature photodetection at 2000 nanometers', *ACS Nano*, 11(6), 5614-5622 (2017). **Citations: 52.**
19. Q. Wang, **Z. Wang**, J. Chang, and W. Ren*, 'Fiber ring laser-based intracavity photoacoustic spectroscopy for trace gas sensing', *Optics Letters*, 42(11), 2114-2117 (2017). **Citations: 22.**
20. Q. Wang, **Z. Wang**, and W. Ren*, 'Wavelength-stabilization-based photoacoustic spectroscopy for methane detection', *Measurement Science and Technology*, 28(6), (2017). **Citations: 17.**
21. Z. Li, **Z. Wang**, Y. Qi, W. Jin, and W. Ren*, 'Improved evanescent-wave quartz-enhanced photoacoustic CO sensor using an optical fiber taper', *Sensors and Actuators B*, 248, 1023-1028 (2017). **Citations: 16.**
22. Z. Li, **Z. Wang**, C. Wang, and W. Ren*, 'Optical fiber tip-based quartz-enhanced photoacoustic sensor for trace gas detection', *Applied Physics B: Lasers and Optics*, 122, 147 (2016). **Citations: 19.**

CONFERENCES:

1. L. Ma, **Z. Wang**, K.-P. Cheong, H. Ning, and W. Ren, 'Mid-infrared heterodyne phase-sensitive dispersion spectroscopy in flame measurements', 37th International Symposium on Combustion, Dublin, Ireland. 7.29-8.3, 2018.
2. **Z. Wang**, L. Ma, K.-P. Cheong, W. Ren, 'CO₂ measurement in laminar premixed flames using heterodyne phase-sensitive dispersion spectroscopy', CLEO: Science and Innovations, San Jose, USA, 5.5-5.10, 2018.
3. **Z. Wang**, W. Ren, 'A QCL-based QEPAS sensor for sensitive C₂H₄ detection'. 2016 Progress in Electromagnetic Research Symposium (PIERS). IEEE, Shanghai, China, 8.8-8.11, 2016.

PATENTS:

W. Ren, L. Ma, **Z. Wang**, K.-P. Cheong, 'Laser Dispersion Spectroscopy for Non-intrusive Combustion Diagnostics', US patent, 2018, Application Number: 15971757.

FUNDING RECEIVED SO FAR

1. Development of ultra-sensitive, wide-dynamic-range and portable gas sensing system for air pollution monitoring (Project No. ITS/018/15), Innovation and Technology Commission (ITC), 01/12/2015 - 31/05/2017.
Role: Major researcher
2. A compact and ultra-sensitive photoacoustic gas sensor with cavity and quartz enhancement (Project No. 24208515), ECS-RGC, Hong Kong, 01/01/2016 - 31/12/2018.
Role: Major researcher
3. Development of a low-cost and ultra-sensitive urea breath analyzer for the detection of *Helicobacter pylori* infection (Project No. GHP/041/14), Innovation and Technology Commission (ITC), 01/05/2016 - 01/05/2018.
Role: Major researcher
4. Mid-infrared fiber-based photoacoustic and photothermal trace gas sensors (Project No. 14206317), GRF-RGC, Hong Kong, 01/01/2018 - 31/12/2020.
Role: Major researcher

PARTICIPATION IN INDUSTRIAL INNOVATION

Cooperate with a company called Uniqueray technique in China to develop the prototype of breath analyzer based on laser spectroscopy.

Company website: <https://www.uniqueray.com/>

Project name: The low cost and high sensitivity breath analyzer for Helicobacter Pylori.

Funding from the government: 98140 EUR

Role: Major researcher

PROFESSIONAL ACTIVITY:

Reviewer, Optics Express

Reviewer, Biomedical Optics Express

Reviewer, Optics and Lasers in Engineering

Reviewer, Applied Physics B: Lasers and Optics

RECENT AWARDS:

Dr. Barbara Kwok Young Postdoctoral Researcher Travel Grants 2019-20.

TEACHING EXPERIENCE:

1. Teaching assistant for Engineering Mechanics, The Chinese University of Hong Kong, Fall 2016.
2. Teaching assistant for Probability and Statistics for Engineers, The Chinese University of Hong Kong, Spring 2017.
3. Teaching assistant for Circuits and Devices, The Chinese University of Hong Kong, Fall 2017.
4. Teaching assistant for Energy Distribution, The Chinese University of Hong Kong, Spring 2018.
5. Teaching assistant for Introduction to Combustion, The Chinese University of Hong Kong, Fall 2018.