

## Quartz-tuning-fork based trace gas sensing

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### *Abstract*

Photoacoustic spectroscopy (PAS) is an effective trace gas sensor technology which employs a broadband microphone for acoustic wave detection. When the output of a near-infrared semiconductor laser is absorbed by a gas sample, the absorbed energy is transformed to heat energy by non-radiative processes, and will subsequently result in an increase of the local temperature and pressure in the sample. Therefore the absorption of a modulated near-infrared laser beam in a gas sample leads to the generation of an acoustic wave. The intensity of the acoustic wave is related to the sample concentration which can be detected by a sensitive microphone. However, most microphone-based PAS cells have a low resonance frequency (<2 kHz), which makes such cells more sensitive to environmental and sample gas flow noise. A recent modification of the conventional PAS is the quartz-enhanced photoacoustic spectroscopy (QEPAS) technique which was first reported in 2002. This technique uses a commercially available millimeter sized piezoelectric quartz tuning fork (QTF) as an acoustic wave transducer. The high Q-factor and narrow resonance frequency band of QTF improve the QEPAS selectivity and immunity to environmental acoustic noise. In this paper, high sensitive trace gas detection based on QEPAS method will be introduced and discussed.

### *Biography:*

Yufei Ma received his Ph.D. degree in physical electronics from Harbin Institute of Technology, China, in 2013. From September 2011 to September 2012, he worked as a visiting scholar at Rice University, USA. Now he is a full professor at the Harbin Institute of Technology. His research interests include optical sensors, trace gas detection, laser spectroscopy, and optoelectronics. He has published more than 100 peer-review papers in which he acts as first or corresponding author. He is serving as Lead Guest Editor for three SCI indexed journal.

[16<sup>th</sup> International Conference on Optics, Lasers & Photonics](#); Prague, Czech Republic- August 20-21,2020.

**Research Journal of Optics and Photonics**  
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### *Abstract Citation :*

Yufei Ma, narrow resonance frequency, QEPAS selectivity, piezoelectric quartz, also high sensitive trace gas detection ,Optic Laser 2020, 16<sup>th</sup> International Conference on Optics, Lasers & Photonics; Prague, Czech Republic- August 20-21, 2020