

The New Development of QEPAS Trace Gas Sensor

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Editorial

Quartz-enhanced photoacoustic spectroscopy (QEPAS) is a novel technique for trace gas sensing which was invented by Prof. Tittel's group in 2002 [1]. QEPAS uses a quartz tuning fork (QTF) as acoustic wave transducer. It process merits of high selectivity, high sensitivity and immune to environmental noise [2]. Therefore it was widely used in many fields and different sensor architecture was developed.

■ Multi-QEPAS (M-QEPAS) sensor: Instead of one QTF employed in QEPAS sensor, multi QTFs was used to build M-QEPAS. The M-QEPAS signal amplitude was enhanced by addition of signal level of each QTF [3]. The schematic plot of M-QEPAS using two QTFs was shown in Figure 1.

■ All-fiber QEPAS sensor: Compared with mirrors, fiber has more stable and flexible configuration. Therefore, the all-fiber structure would save many optical devices, and the whole system of the QEPAS will be more stable and cheaper. An all-fiber QEPAS sensor was demonstrated in [4]. A fiber beam splitter and three QTFs were employed to perform multi-point detection and demonstrated the potential of spatially resolved measurements (Figure 2).

■ Planar laser based QEPAS sensor: The laser beam was shaped as a planar line laser between the gap of the QTF prongs when a cylindrical lens was used [5]. Compared with spherical lens, the planar

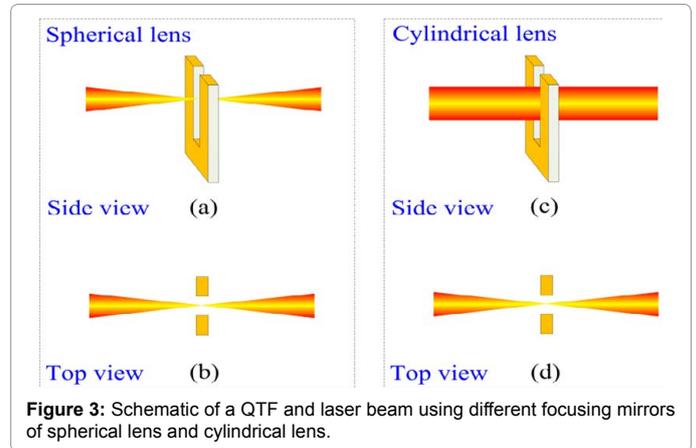
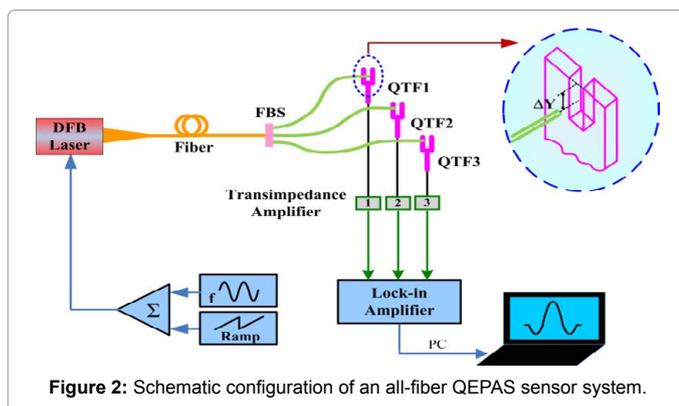
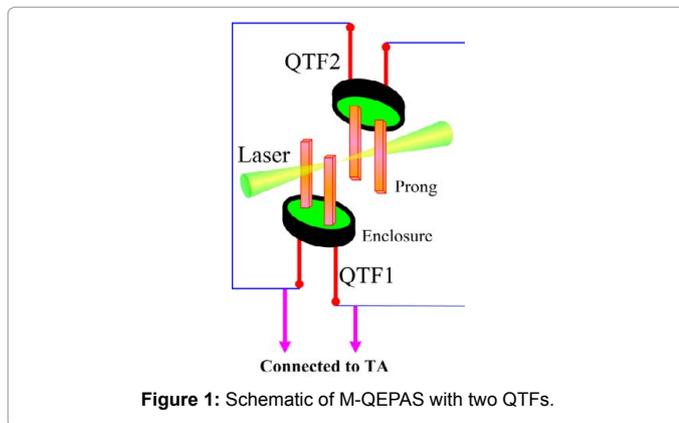


Figure 3: Schematic of a QTF and laser beam using different focusing mirrors of spherical lens and cylindrical lens.

laser based QEPAS sensor has the advantageous of easier laser beam alignment and a reduction of stringent stability requirements (Figure 3).

References

1. Kosterev AA, Bakhrkin YA, Curl RF, Tittel FK (2002) Quartz-enhanced photoacoustic spectroscopy. *Opt Lett* 27: 1902-1904.
2. Ma Y, Lewicki R, Razeghi M, Tittel FK (2013) QEPAS based ppb-level detection of CO and N₂O using a high power CW DFB-QCL. *Opt. Express* 21: 1008-1019.
3. Ma YF, Yu X, Yu G, Li XD, Zhang JB, et al. (2015) Multi-quartz-enhanced photoacoustic spectroscopy. *Appl Phys Letters* 107: 021106.
4. Ma Y, He Y, Xin Yu, Zhang J, Sun R (2016) Compact all-fiber quartz-enhanced photoacoustic spectroscopy sensor with a 30.72 kHz quartz tuning fork and spatially resolved trace gas detection. *Appl Phys Letters* 108: 091115.
5. Ma Y, He Y, Chen C, Xin Yu, Zhang J, et al. (2016) Planar laser-based QEPAS trace gas sensor, *Sensors* 16: 989.



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