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

References


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Received November 03, 2016; Accepted November 04, 2016; Published November 11, 2016


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