Recent Advances of the Quartz-enhanced Photoacoustic Trace Gas Detection Technique

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Abstract— Quartz-enhanced photoacoustic spectroscopy (QEPAS) is an alternative approach to photoacoustic detection of trace gas, exploiting the enhancement of acoustic energy density provided by a quartz tuning fork (QTF), which acts as a high quality factor piezoelectric acoustic transducer and allowing the use of extremely small volumes [1]. We will report on the latest advances and new developments of QEPAS sensors operating in the near-IR, mid-IR and THz spectral ranges. We will review our latest scientific breakthroughs such as the realization of mid-IR fiber coupled QEPAS sensors for leak-detection, the realization of custom QTFs with different geometries resulting in an enhancement of optoacoustic generation efficiency [2]. The result obtained when operating custom QTFs in the THz spectral range [3] with laser sources of limited beam quality [4], and the first demonstration of QEPAS sensors operating in the QTF first overtone flexural mode [5, 6] will be reported.

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