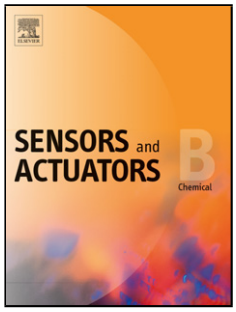


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# Ultra-high sensitive fiber-optic Fabry-Perot cantilever enhanced resonant photoacoustic spectroscopy

Ke Chen, Qingxu Yu*, Zhenfeng Gong, Min Guo and Chao Qu

School of Optoelectronic Engineering and Instrumentation Science, Dalian University of Technology, Dalian, Liaoning, 116024, PR China

*Corresponding author. Tel.: +86 411-84708379; Fax: +86 411-84708379; E-mail address: yuqx@dlut.edu.cn

## Highlights

- A new scheme of fiber-optic cantilever enhanced resonant photoacoustic spectroscopy (CERPAS) is presented.
- A high sensitive fiber-optic cantilever microphone is designed to match with the resonant photoacoustic cell.
- The detection limit for acetylene is achieved to be 80 ppt.

## Abstract

A new scheme of fiber-optic cantilever enhanced resonant photoacoustic spectroscopy (CERPAS), combining high sensitive fiber-optic Fabry-Perot cantilever microphone with resonant photoacoustic spectroscopy, is presented for trace gas detection. A fiber-optic cantilever microphone with high sensitivity at the frequency near 1.4 kHz is designed to match with a first-order longitudinal resonant photoacoustic cell, whose resonant frequency is 1402 Hz. For sensitivity improvement, an erbium-doped fiber amplified near-infrared laser, with the central wavelength of 1532.83 nm and the maximum output power of 1 W, is used as the light source for acoustic excitation. The trace acetylene detection experiment demonstrates that, with the wavelength modulation spectrum and second-harmonic detection methods, the gas detection limit is achieved to be 80 ppt, which is at least one order of magnitude improvement compared with other photoacoustic acetylene sensors reported so far.