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A Novel Photoacoustic Spectroscopy Gas Sensor Using a Low Cost Polyvinylidene Fluoride Film

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Highlights

- A proof-of-concept of an innovative photoacoustic spectroscopy gas sensor based on a low cost polyvinylidene fluoride (PVDF) film was introduced and demonstrated.
- The photoacoustic signal was detected with a low cost PVDF film being used as transducer, instead of using conventional microphone or quartz tuning fork.
- The use of PVDF film as transducer for photoacoustic signal sensing offers good flexibility, water resistance, chemical stability, low cost, simple configuration and convenient optical alignment.

Abstract: A proof-of-concept gas sensor based on innovative photoacoustic spectrophone was introduced for purpose of developing a low cost and simple configuration photoacoustic spectroscopy gas sensor and demonstrated, in which the photoacoustic signal was detected with a low cost polyvinylidene fluoride (PVDF) film being used as transducer, instead of using conventional microphone or quartz tuning fork. In such a PVDF-based photoacoustic spectroscopy (PVDF-PAS) approach, the PVDF film plays a role both as a cantilever used in cantilever-enhanced photoacoustic spectroscopy and as a piezoelectric quartz tuning fork used in quartz-enhanced photo-acoustic spectroscopy. Feasibility of the introduced PVDF-PAS for trace gas sensing was demonstrated by measuring H₂O vapor with a minimum detection limit of 40 ppmv using a lock-in time constant of 30 ms, this corresponding to a normalized noise

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