Photothermal gas detection techniques

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Photothermal spectroscopy (PTS) is a technique used for determining the composition of liquids, solids and gases. In PTS, the sample is illuminated with a radiation source, and the thermal response of the analyte (e.g., refractive index change) is analyzed to gain information about its composition. Recent advances in this unique method of detecting gaseous samples show that photothermal gas spectroscopy can be an interesting alternative to commonly used absorption techniques. If designed properly, sensors using PTS technique can not only reach sensitivities comparable with other, mature and complex spectroscopic signal retrieval techniques, but can in some cases simplify the design of the sensor. This is especially evident in the recently introduced hollow-core-fiber-based photothermal gas sensors. Key approaches to photothermal gas detection will be discussed during the presentation.

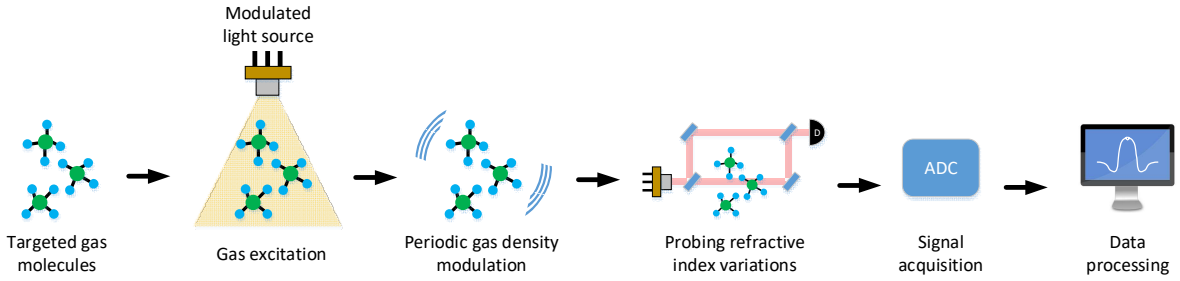

Fig. 1. Principle of photothermal gas detection.

1. K. Krzempek, Applied Sciences **9**, 2826 (2019).
2. K. Krzempek, P. Jaworski, P. Kozioł, and W. Belardi, Sensors and Actuators B: Chemical **345**, 130374 (2021).
3. K. Krzempek, G. Dudzik, and K. Abramski, Opt Express **26**, 28861 (2018).