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# MoS<sub>2</sub>-based all-fiber humidity sensor for monitoring human breath with fast response and recovery

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## Highlights

- A humidity fiber-optic sensor for human breath monitoring is demonstrated using Molybdenum disulfide (MoS<sub>2</sub>).
- MoS<sub>2</sub> nanosheets, as an excellent sensitive material, can bring a 14 fold enhancement of light power variation in response to human breath compared with bare ESMF.
- The experimental results show rather fast response and recovery speed (0.066 s response and 2.395 s recovery time).
- This sensor provides a safe approach for fast human breath monitoring during a magnetic resonance imaging (MRI) treatment.

## ABSTRACT

A humidity sensor is demonstrated using a MoS<sub>2</sub>-coated etched single-mode fiber (ESMF) and applied in human breath monitoring. Because of the interaction between MoS<sub>2</sub> nanosheets and the evanescent field of an ESMF, the light confined within fiber core could be tuned by ambient conditions. The optical frequency conductivity of MoS<sub>2</sub> changes with relative humidity variation, so does the transmission light power of the ESMF. A 14 fold enhancement of light power variation in response to human breaths is achieved compared with a bare ESMF. Fast response and recovery speed (0.066 s response and 2.395 s recovery time) enable this sensor to detect human breath in real time. The results also show the feasibility in monitoring different breath patterns related to the breath frequency and depth.

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