Enhanced transduction of photonic crystal dye lasers for gas sensing via swelling polymer film

We present the enhanced transduction of a photonic crystal dye laser for gas sensing via deposition of an additional swelling polymer film. Device operation involves swelling of the polymer film during exposure to specific gases, leading to a change in total effective refractive index. Experimental results show an enhancement of 16.09 dB in sensing ethanol vapor after deposition of a polystyrene film. We verify different responses of the polystyrene film when exposed to either ethanol vapor or increased humidity, indicating selectivity. The concept is generic and, in principle, straightforward in its application to other intracavity-based detection schemes to enable gas sensing. © 2011 Optical Society of America.

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