

課題番号 : F-19-UT-0017
利用形態 : 機器利用
利用課題名(日本語) :
Program Title (English) : Parylene E-based VOC gas detector
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キーワード/Keyword : リソグラフィ・露光・描画装置, N&MEMS, Gas Sensor

1. 概要(Summary)

A capacitive volatile organic compound (VOC) detector with parylene E-coated high-aspect-ratio (HAR) deep electrodes has been developed. From evaluations of the VOC sensing performance in steady-state flow, the sensitivity of the HAR detector achieves 48 times higher than that of the planar type detector. In GC experiments, the present HAR detector captures well-resolved peaks of VOC mixtures, validating its use as a gas chromatography detector. The sensitivity of the HAR detector against toluene vapor is estimated to be 0.073 fF s/ppm, which is over 5 times of that of the state-of-the-art PDMS planar detector.

2. 実験(Experimental)

【利用した主な装置】

高速大面積電子線描画装置, マスク・ウエーハ自動現像装置群, ステルスダイサー, ブレードダイサー

【実験方法】

Glass photomask is made using F5112+VD01. Silicon wafers are diced by DISCO DFL7340 after photolithography.

3. 結果と考察(Results and Discussion)

Figure 1 shows a photo of the fabricated detector and the cross-sectional view of etched electrodes after DRIE process and chemical vapor deposition (CVD) of 0.3 μm -thick parylene E. Parylene E is CVD deposited onto the electrode surface.

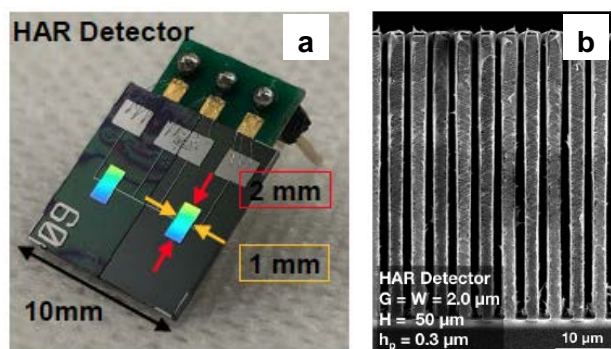


Fig. 1 (a) Capacitive detector with HAR electrodes fabricated from SOI wafer. (b) SEM image of deep silicon electrodes after CVD of parylene E.

The equilibrium/dynamic gas sensing performance of the present detector has been characterized based on steady-state measurements and GC experiments. It is demonstrated that the proposed HAR detector can far exceed the performance of the state-of-the-art PDMS detector.

4. その他・特記事項(Others)

共同研究者: Prof. Yogesh B. Gianchandani, WIMS², University of Michigan, USA

5. 論文・学会発表(Publication/Presentation)

- (1) Yeh, C.-H., Zhao, X., Qin, Y., Gianchandani, Y., Suzuki, Y., and Morimoto, K., 20th Int. Conf. Solid-state Sensors, Actuators, and Microsystems (Transducers '19), Berlin, (2019), T3P.036.

6. 関連特許(Patent)

なし