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利用形態　:機器利用
利用課題名（日本語）　:
Program Title (English)　:Study on VOC Sensing Properties of Parylene E
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キーワード／Keyword　:リソグラフィ・露光・描画装置, Gas Sensor, VOC sensing

1. 概要（Summary）

The material properties of CVD-deposited parylene E have been characterized in the pursuit of gas sensing applications for the first time. The per formance of parylene E as a gas sensing material has been benchmarked using capacitive detectors with interdigitated electrodes. In the toluene – parylene E system, the partition coefficient and the diffusivity as a function of temperature are quantified. It is found that the heat-treated parylene E possesses PDMS like nature of sorption affinity to nonpolar VOC (Volatile Organic Compound) vapor with high sensitivity. The present findings of excellent VOC sensing performance of parylene E would provide leverage in future high-sensitivity gas sensors.

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）

As shown in Fig. 1, the gas sensing performance of parylene E has been benchmarked using capacitive detectors with interdigitated electrodes. In the toluene–parylene E system, the equilibrium and dynamic responses have been quantified in the form of the partition coefficient and diffusivity, respectively. Temperature-dependent diffusivity follows the Arrhenius-type relation, and the partition coefficient of the toluene – parylene E system becomes as large as 2500 at room temperature. It is supported by diffusion modeling in swollen parylene E that heat-treated parylene E has PDMS-like nature of sorption affinity to nonpolar volatile organic compound (VOC) vapor.

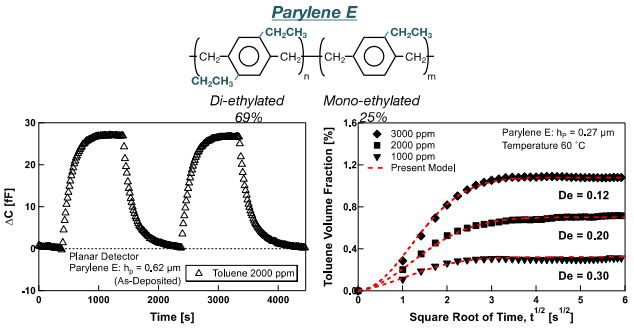

Fig. 1 Molecular structure of parylene E and the response to the toluene vapor in the benchmarking format of standard chemi-capacitive detector with chemical vapor deposition.

4. その他・特記事項（Others）

なし

5. 論文・学会発表（Publication/Presentation）

(1) Morimoto, K., Yeh, C.-H., Mito, T., and Suzuki, Y., “Volatile Organic Compound Sensing Properties of Parylene E: Thermal Transition and Sorption Kinetics,” Macromolecules, Vol. 53, No. 14, pp. 6024-6031 (2020).

6. 関連特許（Patent）

なし