Multi-layering of Dry Film Photoresist without Air Bubble

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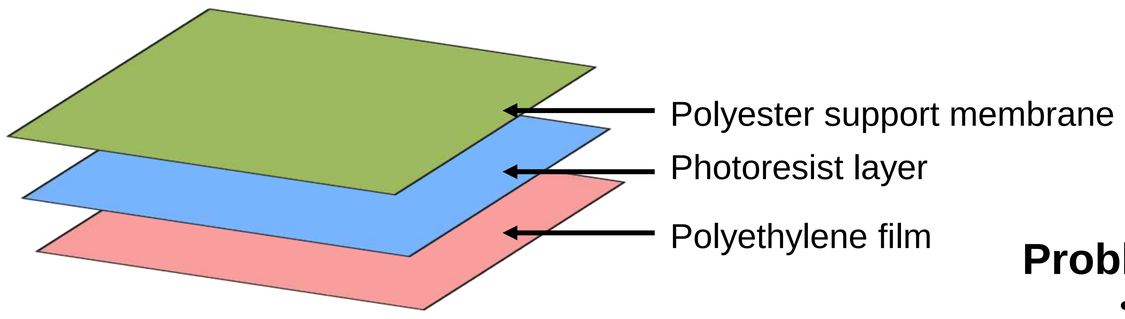
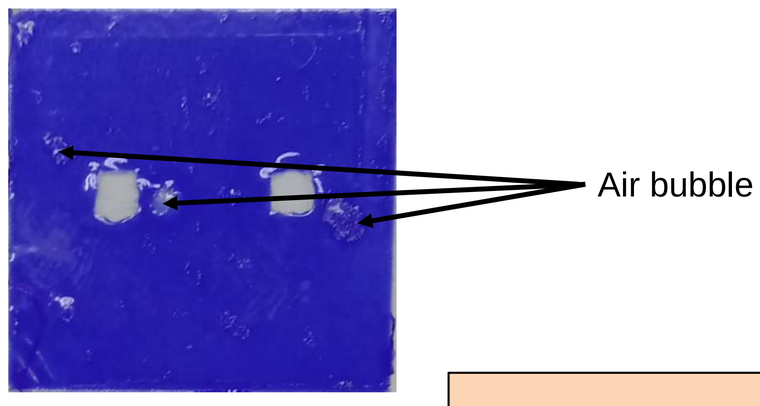
INTRODUCTION

Dry film photoresist (DFR)



Advantages in using DFR

- ✓ Fast and simple patterning process at lower temperatures[1].
- ✓ Does not require thermal baking process.
- ✓ Simple lamination step.
- ✓ Good for roll-to-roll fabrication process [1].
- ✓ Cost-effective production [2].



Problem:

- High probability of forming air bubbles during DFR lamination.
- Air bubbles affect the quality of fabricated devices.

Proposed solution:

Using a droplet of water between the DFR and the glass may reduce air bubbles between the DFR and the glass[3].

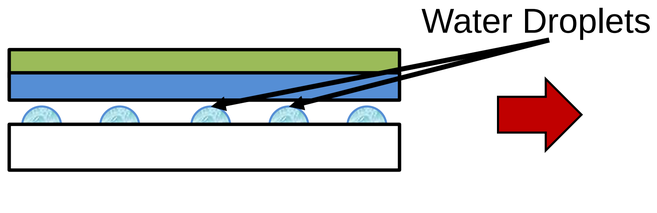
Objectives:

- ➢ Eliminate Air bubbles
- ➢ Multi-layer Dry film photoresist

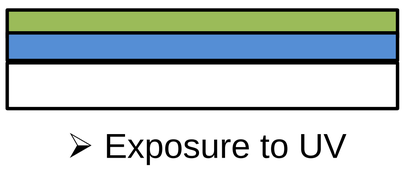
METHODOLOGY

Legend:
- - Glass Substrate
- - Optical mask pattern
- - Photoresist layer
- - Polyester support membrane

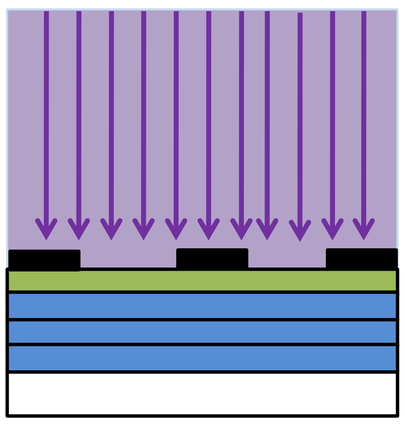
➢ Spraying of water
➢ Attachment of DFR (1st layer)



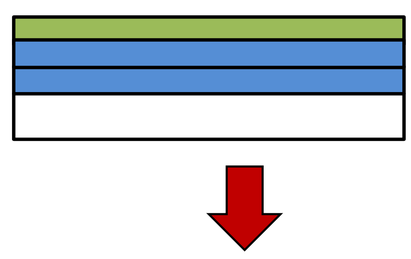
➢ Lamination starts at 60°C with increment of 10°C until 120°C is reached.



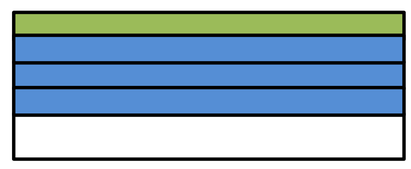
➢ Exposure to UV



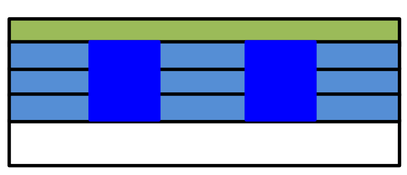
➢ Attachment of DFR (2nd layer)
➢ DFR lamination at 120°C



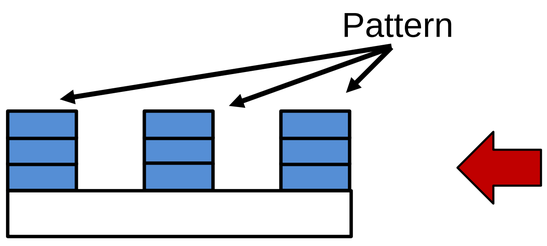
➢ Attachment of DFR (3rd layer)
➢ DFR lamination at 120°C



➢ After UV exposure
➢ Developer solution (K_2CO_3+H_2O) was used.

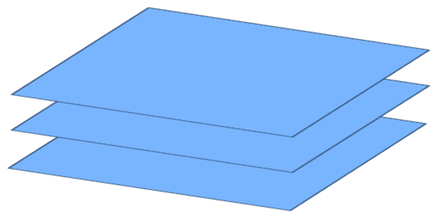


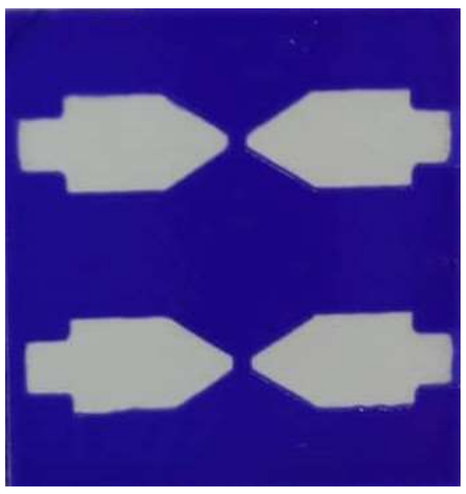
➢ After developing process



RESULTS AND DISCUSSION

3-layer DFR Total thickness: 114.3 µm





➢ Results show that no air bubbles were formed during the lamination process

➢ Spraying water droplets on glass substrate before depositing the 38.1 µm-thick DFR and scraping off excess water between the glass and DFR eliminates trapped gases that may cause air bubbles in the lamination process.

➢ Successful in developing a 3-layer DFR with total thickness of 114.3 µm, thus a possible solution to fabricate single-wall carbon nanotubes (SWCNT) container for sensor applications.

REFERENCES:

[1] Hwang, B., Matteini, P. Review on dry film photoresist-based patterning of Ag nanowire flexible electrodes for wearable electronics. *Fash Text* 9, 27 (2022). https://doi.org/10.1186/s40691-022-00303-x
[2] Farjana, S.; Ghaderi, M.; Rahiminejad, S.; Haasl, S.; Enoksson, P. Dry Film Photoresist-Based Microfabrication: A New Method to Fabricate Millimeter-Wave Waveguide Components. *Micromachines* 2021, *12*, 260. https://doi.org/10.3390/mi12030260
[3] z, l & Wang, Wei & Ju, Xiao-Jie & Xie, Rui & Liu, Zhuang & Chu, Liang-Yin. (2014). Fabrication of glass-based microfluidic devices with dry film photoresists as pattern transfer masks for wet etching. RSC Adv.. 5. 10.1039/C4RA15907A.

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