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Novel large-scale PDA/rGO free-standing nanofilms – perspectives in photoelectronics

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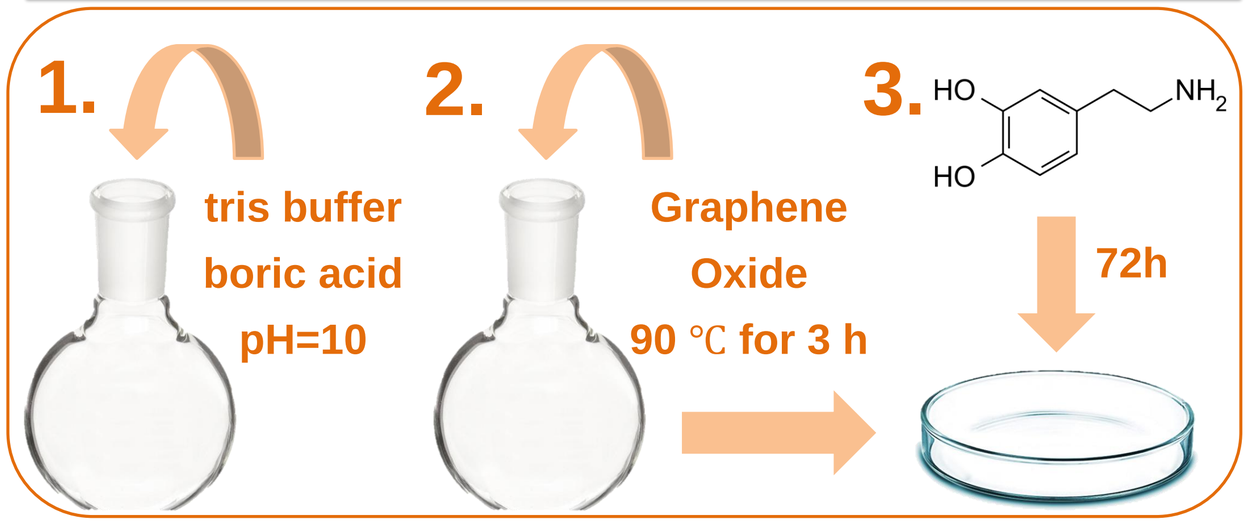
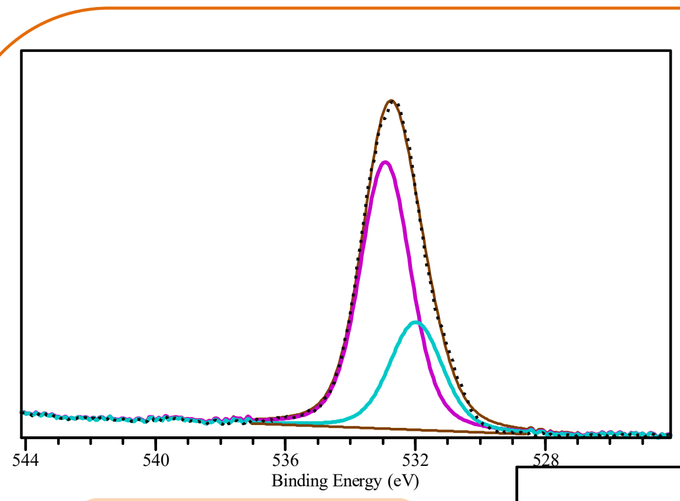
INTRODUCTION & AIM

Polydopamine (PDA) naturally assembles into thin films at the air–water interface through the oxidation and polymerization of dopamine, forming large-scale nanostructures [1]. Meanwhile, graphene-derived materials, particularly reduced graphene oxide (rGO), are extensively used in electronic applications for their excellent conductivity and mechanical properties [2]. In this study, we engineered a PDA/rGO nanocomposite aimed at advancing materials for flexible electronics. The successful integration of rGO into the PDA matrix was confirmed using X-ray photoelectron spectroscopy (XPS). Electrical performance was assessed via four-point probe conductivity measurements, and the films' light-responsive behavior was characterized through optical dynamics techniques.

SYNTHESIS METHOD



XPS RESULTS

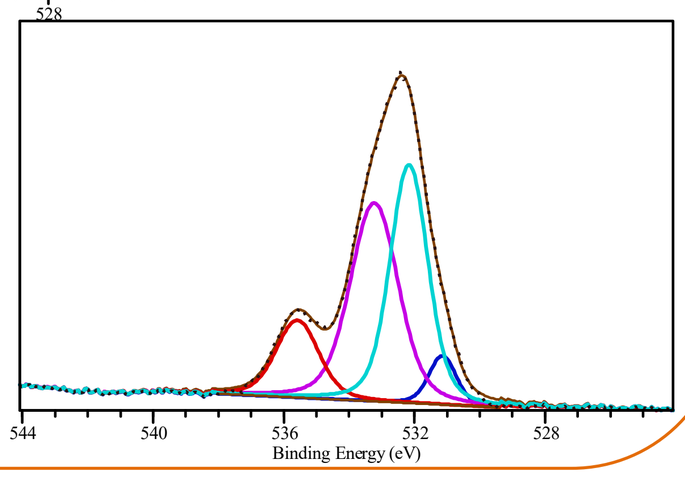


PDA

O–C 532.92
O=C 531.98

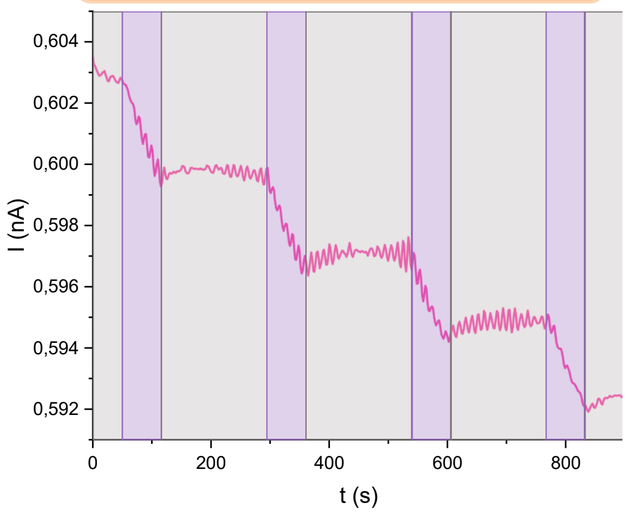
PDA/rGO

O–C=O 535.58
O–C 533.23
O=C 532.17
OH 531.14

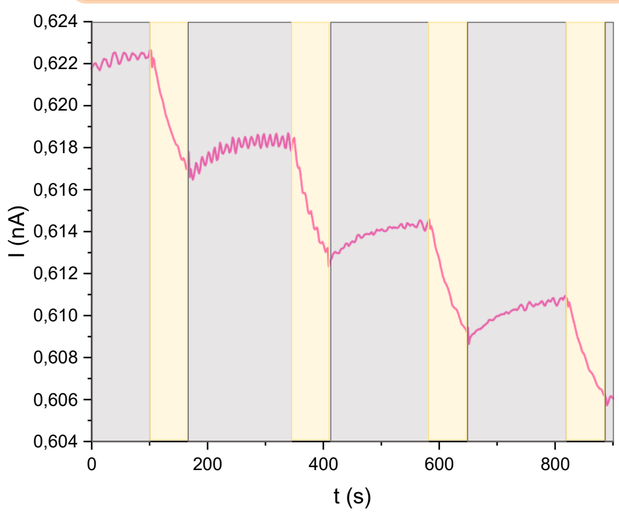


4 POINT PROBE MEASUREMENTS

white LED light

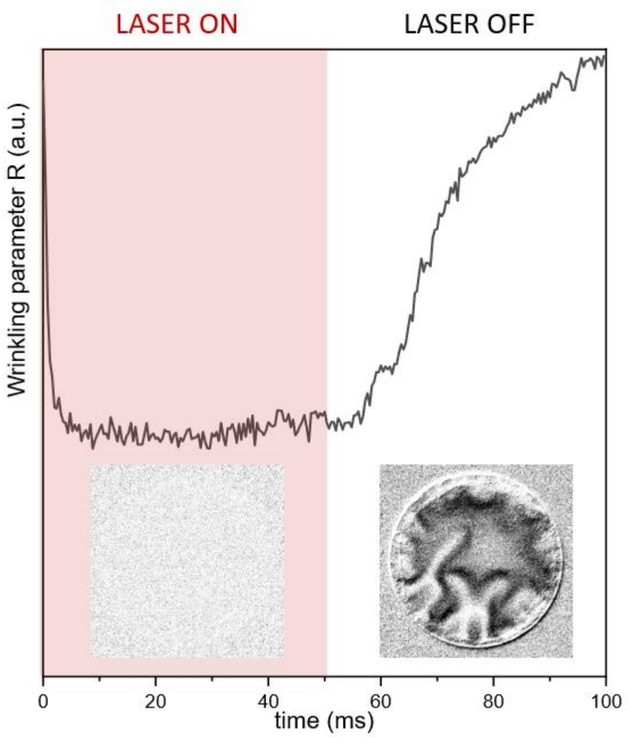


wavelength = 373nm

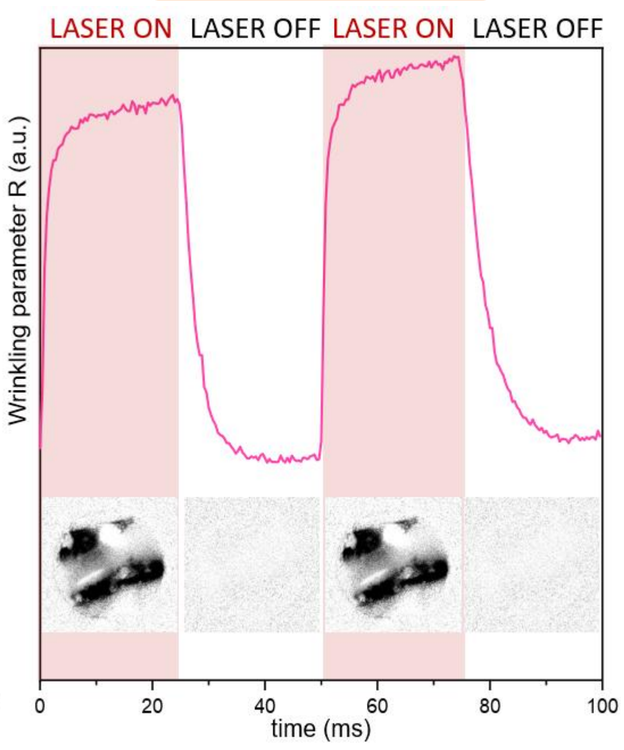


LIGHT ACTUATION MEASUREMENTS

PDA



PDA/rGO



CONCLUSIONS

Four-point probe (4PP) measurements revealed a reduction in conductivity of the PDA/rGO nanocomposite under light exposure. This change is both reversible and highly-quantifiable. Notably, unlike pure PDA, the nanocomposite films exhibit light-driven actuation primarily through thermal expansion rather than moisture-related mechanisms [1]. These findings highlight promising directions for the development of next-generation photoelectronic devices.

REFERENCES

[1] J. Szewczyk et. al, *ACS Appl Mater Interfaces* **2023**, *15*, 36922.
[2] T. H. Han et. al, *Materials Science and Engineering R: Reports* **2017**, *118*, DOI10.1016/j.mser.2017.05.001.

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