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Graphene Quantum Dot Based Nanozymes: A Promising Platform for NADPH Detection and Oxidative Stress Sensing

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INTRODUCTION & AIM

- NADPH, a target of metabolism functions as a reducing agent in many biosynthetic and antioxidant reactions in cells.
- Nanozymes are nanomaterials that display catalytic properties.
- Nanozymes can be divided into carbon based, metal based, metal oxide based and metal organic framework
- Graphene quantum dots due to their unique optical and electronic properties hold significant potential in sensing applications
- Accurate and sensitive detection of NADPH is crucial for studying its role in cellular processes.

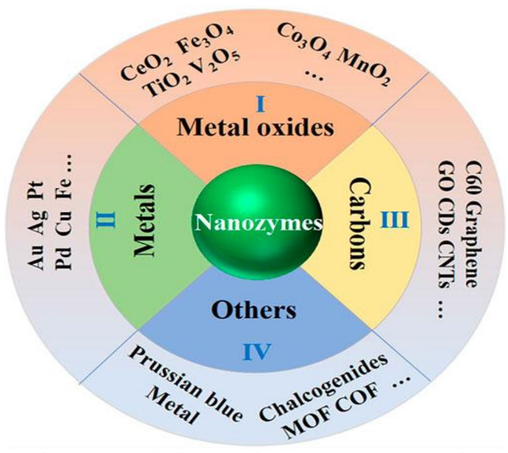


Figure 1: Schematic presentation of nanozymes classifications (metal-, metal oxide-, and carbon-based nanozymes and other nanozymes like MOF, COF. (Long *et al.*,2021)

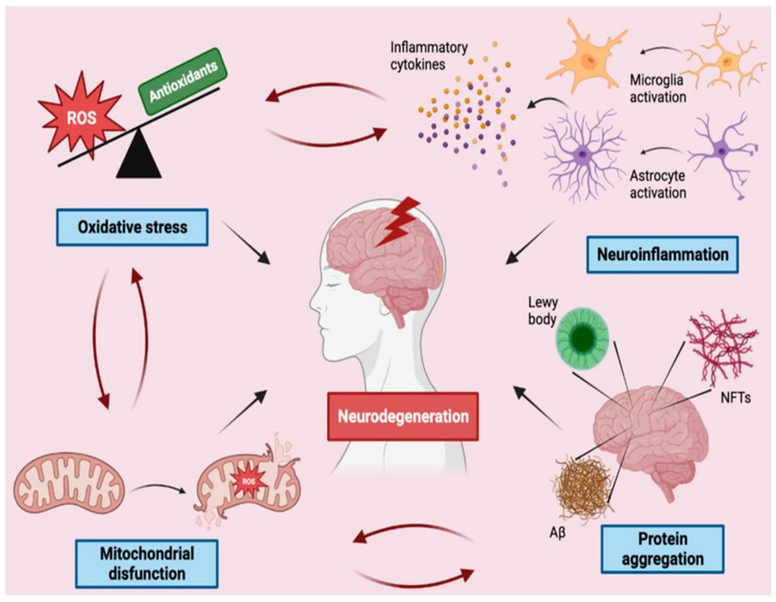
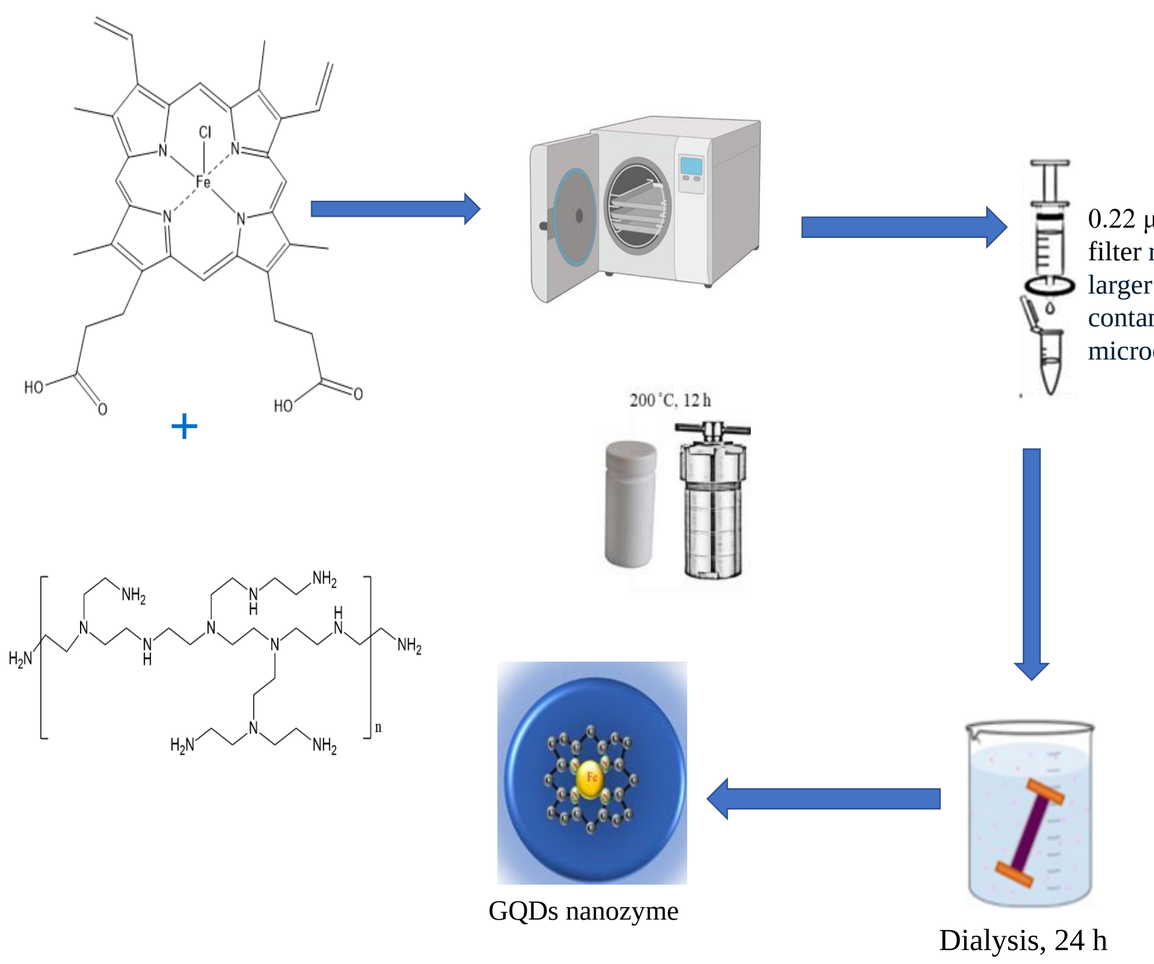


Figure 2: Schematic illustration showing how oxidative stress, mitochondrial dysfunction, neuroinflammation, and protein aggregation interact to drive neurodegeneration.

AIM

To synthesize , characterize graphene quantum dots with catalytic properties and test its fluorescence properties.

METHOD



RESULTS & DISCUSSION

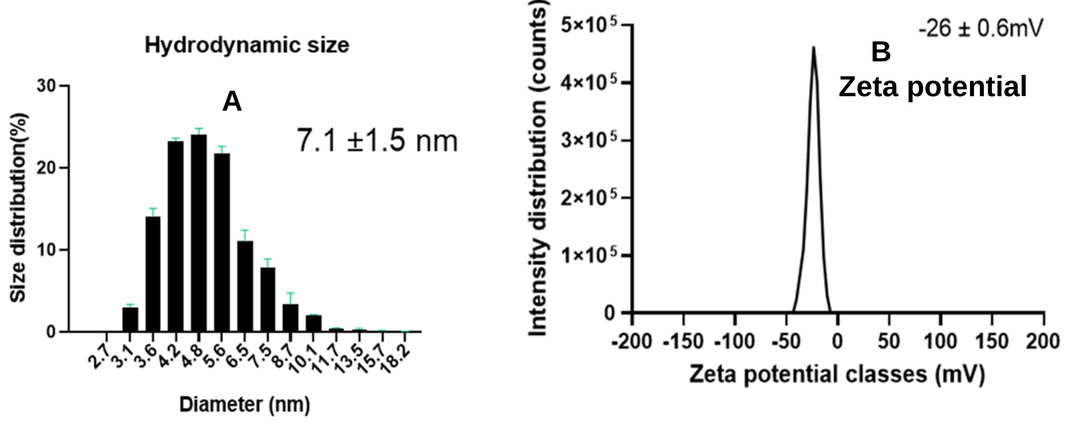


Figure 3. Characterization of the synthesized GQDs**.** 3C shows Fluorescence emission spectra comparing control (red) and graphene quantum dots (blue). The control sample, lacking nanoparticles, shows negligible fluorescence, whereas the 5 µg GQD sample displays a strong emission peak, confirming their successful synthesis and intrinsic optical properties.

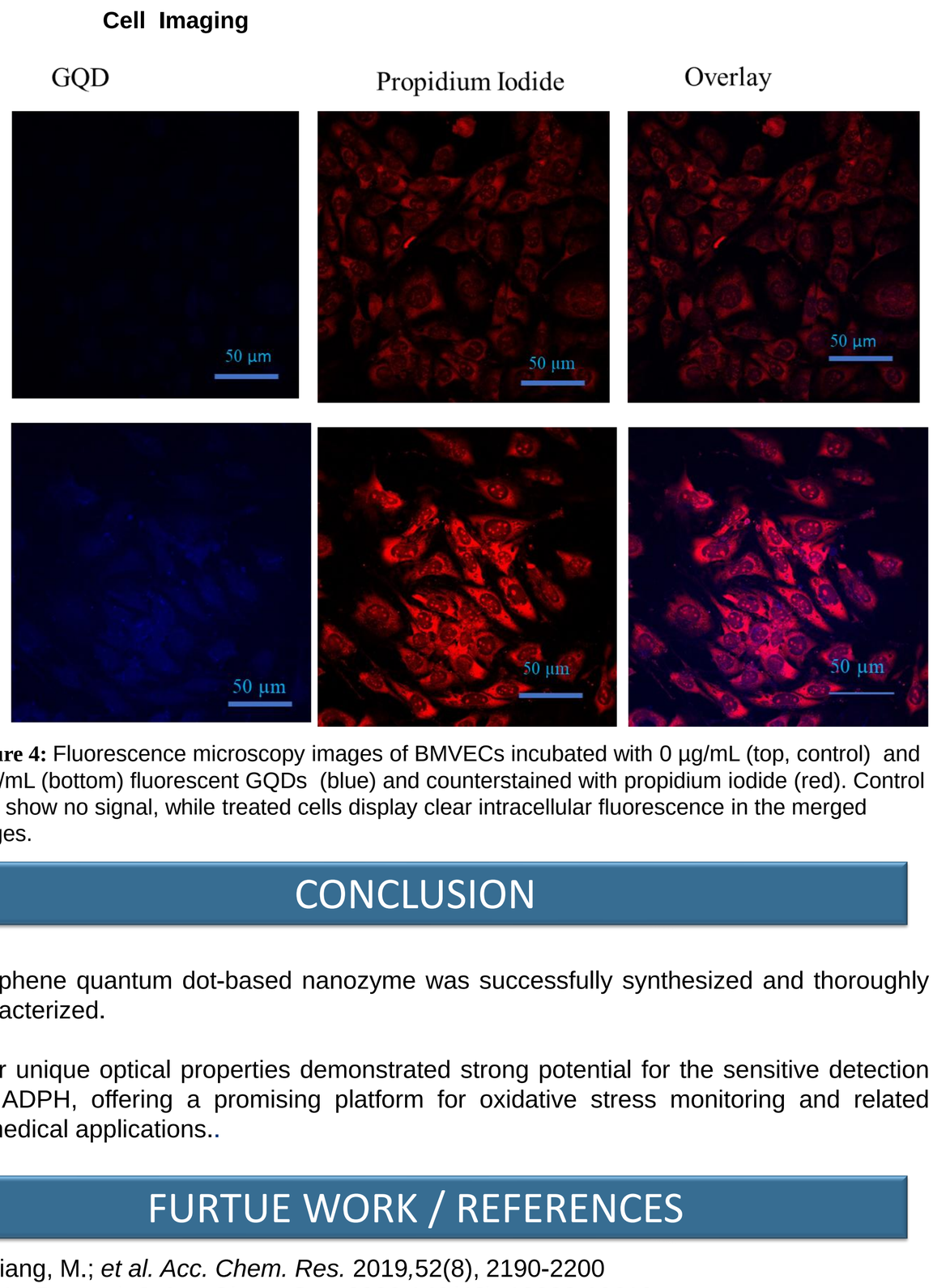


Figure 4: Fluorescence microscopy images of BMVECs incubated with 0 µg/mL (top, control) and 5 µg/mL (bottom) fluorescent GQDs (blue) and counterstained with propidium iodide (red). Control cells show no signal, while treated cells display clear intracellular fluorescence in the merged images.

CONCLUSION

- Graphene quantum dot-based nanozyme was successfully synthesized and thoroughly characterized.
- Their unique optical properties demonstrated strong potential for the sensitive detection of NADPH, offering a promising platform for oxidative stress monitoring and related biomedical applications..

FURTUE WORK / REFERENCES

- Liang, M.; *et al. Acc. Chem. Res.* 2019,52(8), 2190-2200
- Wu, D.; *et al. J. Am. Chem. Soc.* 2020,142(46), 19602-19610