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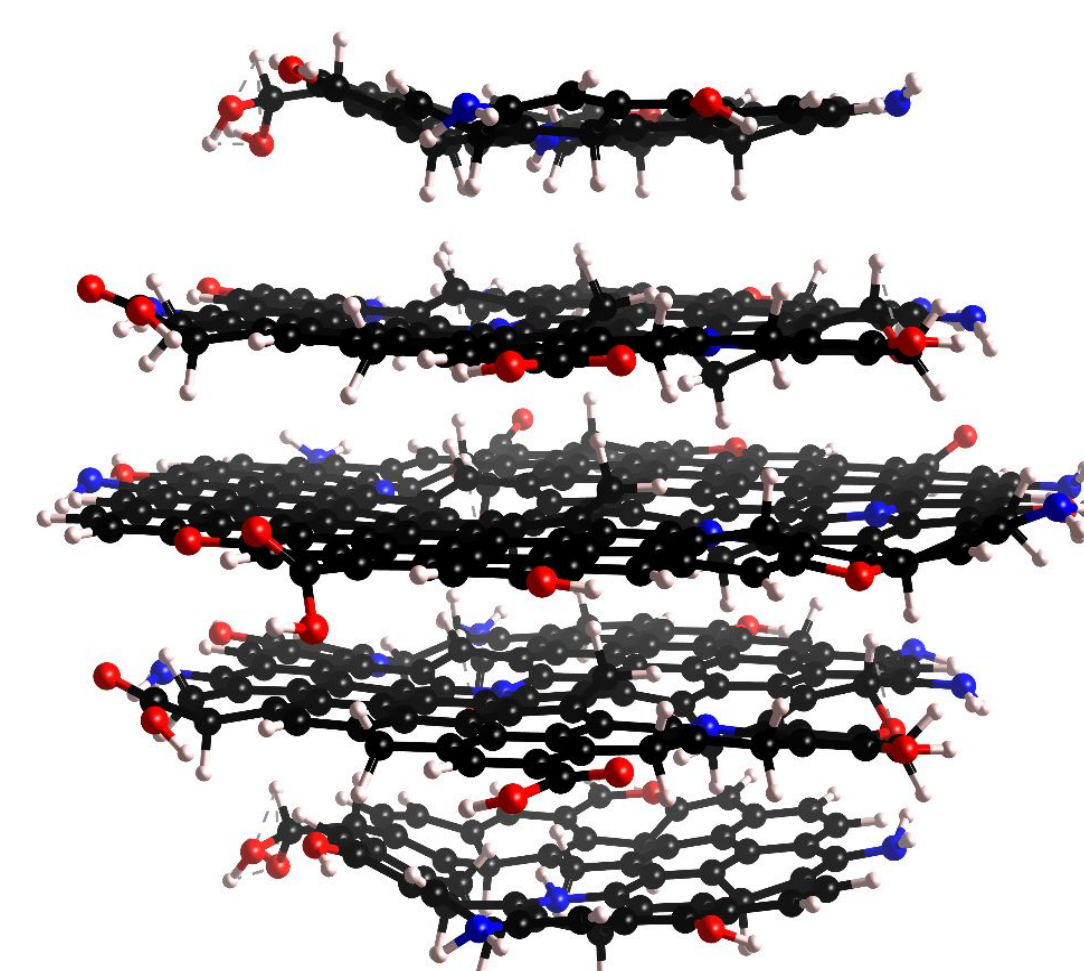
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Abstract

Graphene quantum dots (GQDs) are spherical nanoparticles comprised of stacked layers of graphene known in part for their biocompatibility and fluorescence, which leads to many potential uses in medicine as a diagnostic tool. Solutions of GQDs are known to fluoresce less when the GQDs are allowed to clump together, leading to processes such as sonication being used to break apart these clumps in research environments. Similarly, the addition of surfactants to a solution of GQDs has also been found to modify fluorescence response of the solution. This research explores the effect of introducing four different human blood proteins and GT6 DNA strands on the fluorescence response of reduced graphene quantum dots (rGQDs). Fibrinogen, transferrin, gamma globulin, and albumin were added to samples of rGQDs in increments around their respective concentrations in human blood. Generally, we found that the addition of any of the blood proteins lowered fluorescence response in the visible spectrum. In the near-infrared spectrum, smaller concentrations of blood proteins generally increased fluorescence response, while larger concentrations reduced fluorescence response below the control. This has implications for deep-tissue imaging relying on the near-infrared fluorescence of intravenous GQDs.

IntroductionGraphene Quantum Dots (GQDs)

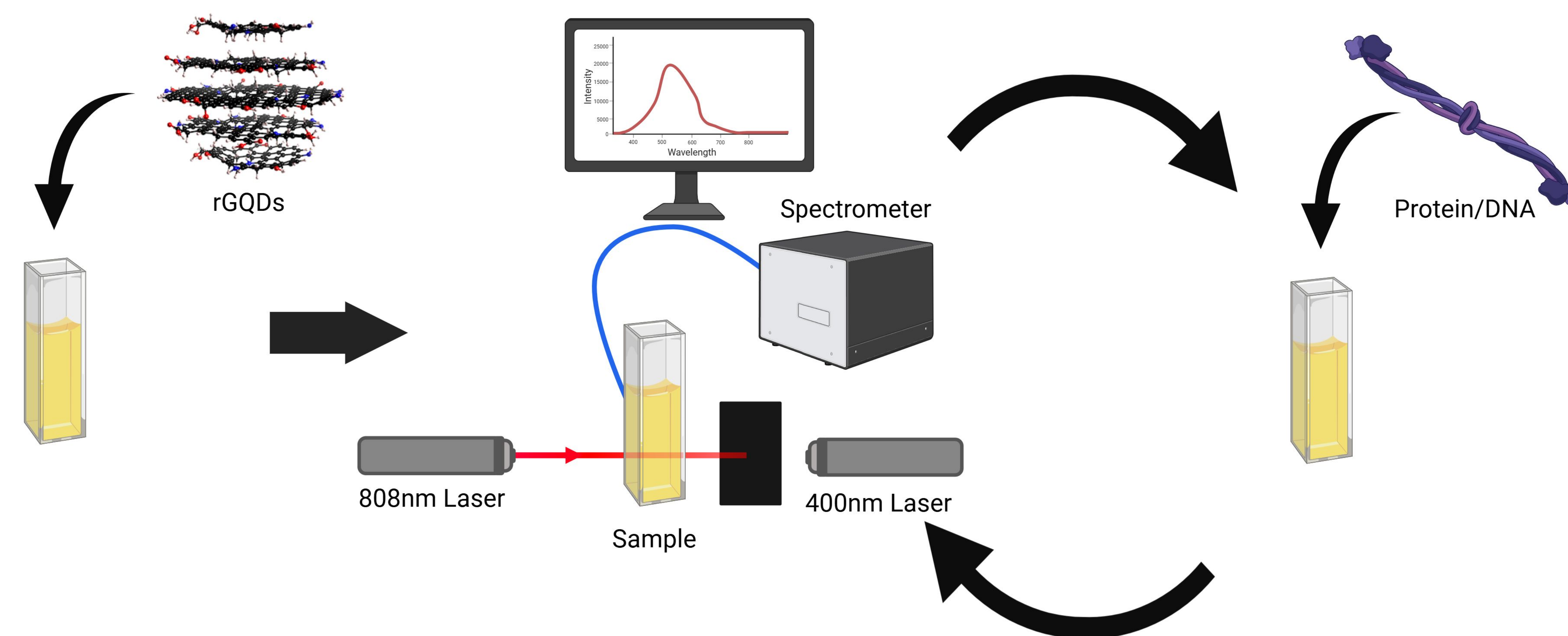
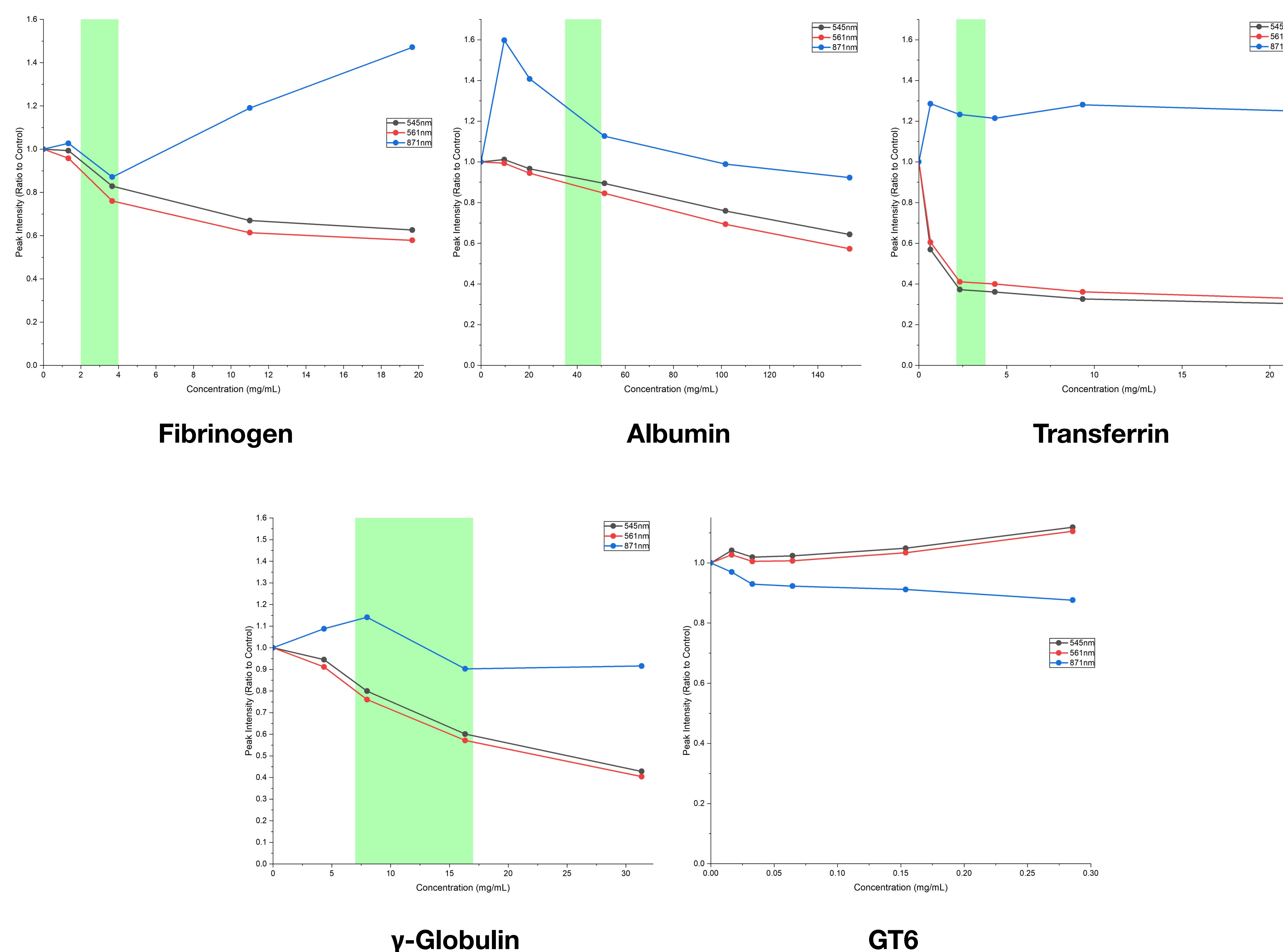
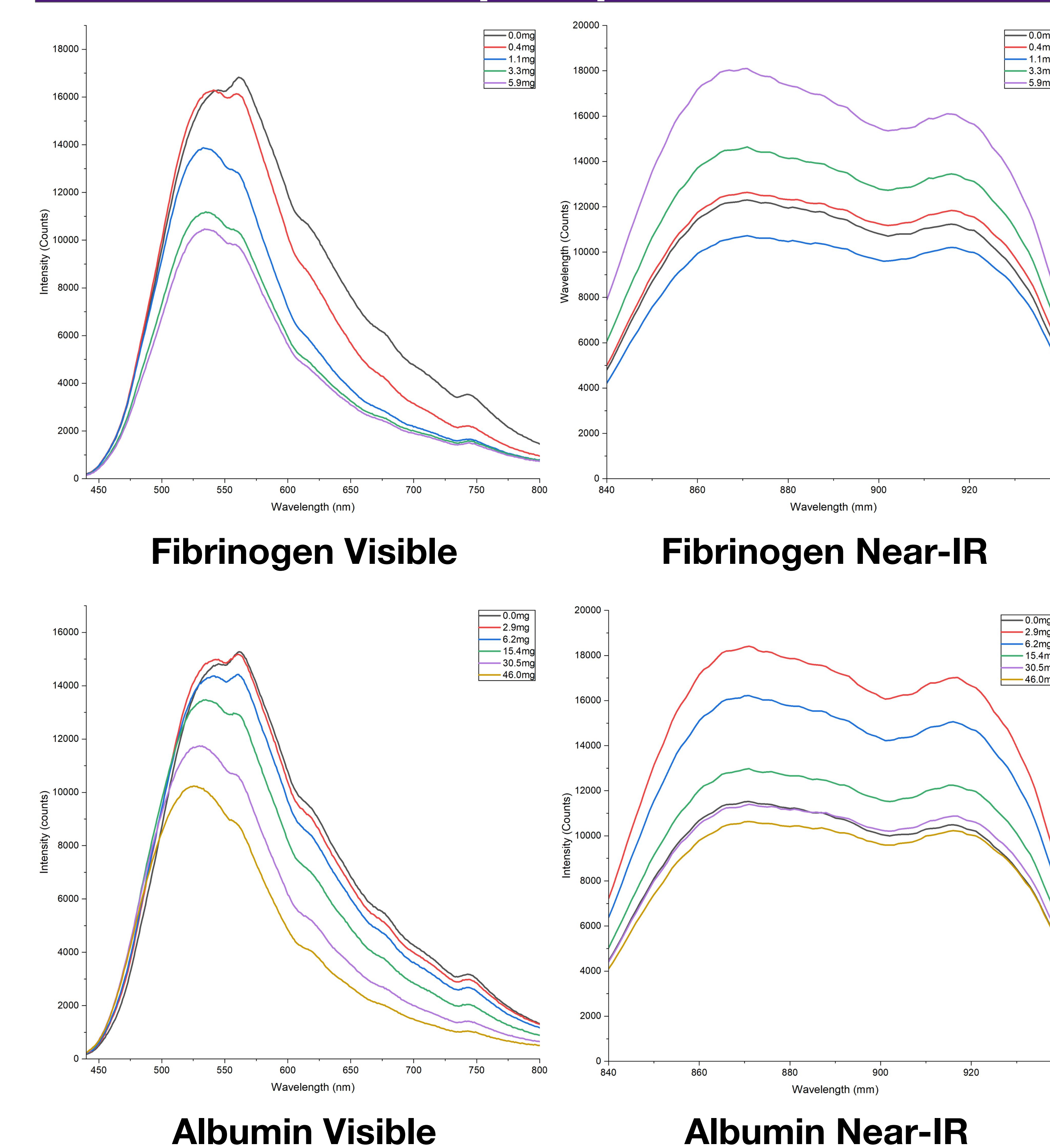
- Nanoparticles
- Naturally clump
- Fluoresce in visible and near-infrared wavelengths
- Used in biological imaging

GQD Fluorescence

- Emitted wavelength depends on GQD size
- Clumping inhibits fluorescence
- Attached molecules can modify fluorescence

Blood Proteins & GT6

- Present in imaging environments
- Can attach to GQDs

Methods**Fluorescence Peaks vs. Concentration****Sample Spectra****Conclusion**

This project has investigated the effects of human blood proteins and DNA strands on fluorescence of reduced graphene quantum dots. Generally, blood proteins decreased the visible fluorescence of GQDs, which has implications for biological imaging applications. Based on the shifting of visible fluorescence peaks, this research supports proteins interfere with GQD fluorescence based on GQD size, indicating proteins may size-select GQDs in other applications.

Next Steps

- Test biological proteins on NGQDs
- Perform in-depth peak analysis on visible spectra

References

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