Engineering safe carbon-based nanocomposite materials by understanding the interactions of nanocomposites towards algae

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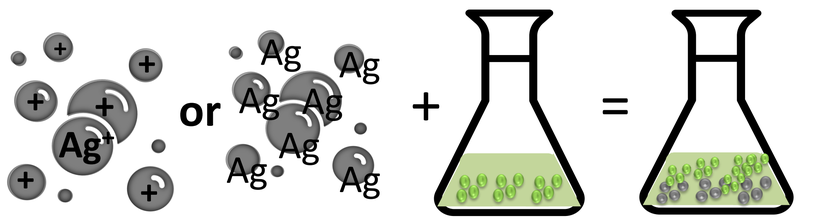
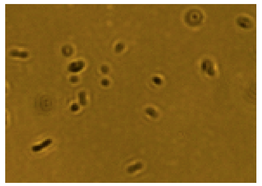
Introduction

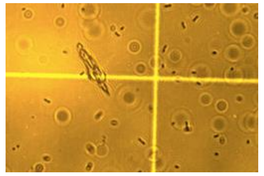
- Silver ion and Silver nanoparticles have shown to be toxic to different microorganisms.
- *Microcystis aeruginosa* is a freshwater cyanobacteria that posses' harmful toxins for those living in contaminate areas.
- **Main goal:** Identify the effective concentration where 50% of the organisms display a change in growth (EC_{50}).

Conditions

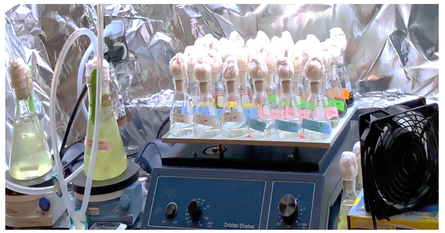




50 µg/L Ag^+



50 µg/L Ag NP



Conditions: *Microcystis aeruginosa*
96 h exposure
2 x 10^6 cells/mL
Silver doses: 0-100 µg/L

Results

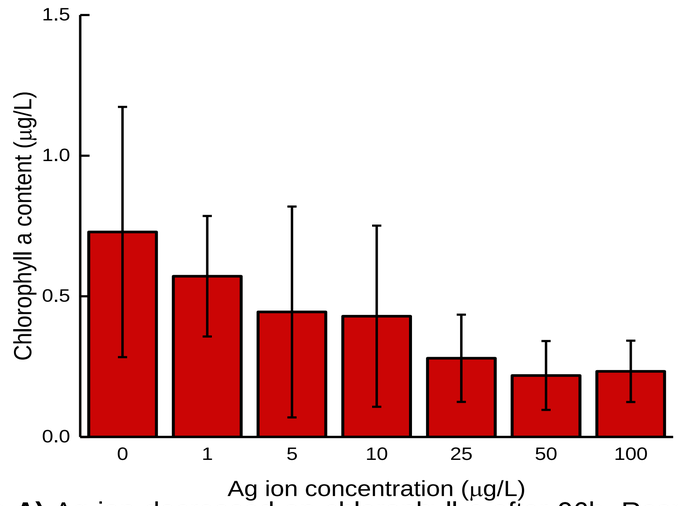


Figure A) Ag ion decreased on chlorophyll *a* after 96h. Response at concentrations of 13 µg/L, n=6.

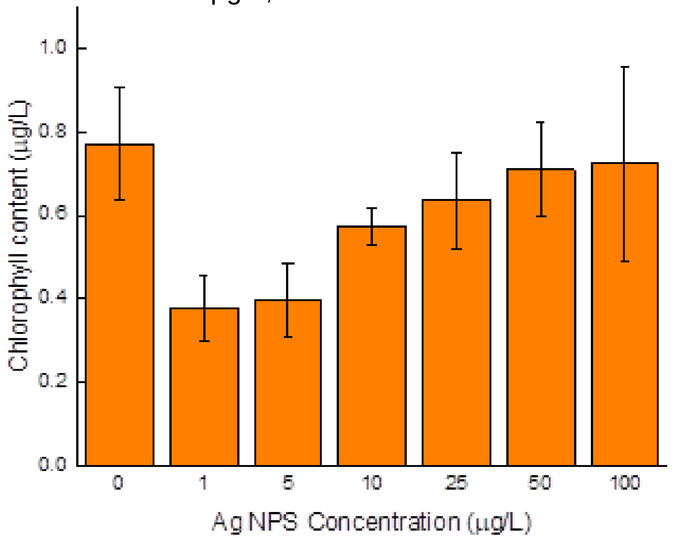


Figure B) Ag NP increased on chlorophyll *a* after 96h. Response at concentrations of 1.6 µg/L, n=3.

Conclusion

- After evaluating the results, *M. aeruginosa* is less sensitive to the effects of Ag NPS when compared to Ag^+ at same dose-response concentrations. (More experiments to be performed to confirm results.)
- Ag^+ and Ag NPs showed a response at concentration of 13 µg/L and 1.6 µg/L respectively as shown by the EC_{50} value.

Future Work

- Finalized Ag NPS experiments to confirm results.
- Use the EC_{50} from previous experiments to start nanocomposites dose-response trials using GO-Ag^+ and GO-Ag NPS.
- Find the EC_{50} respectively and determine nanocomposites toxicity.
- Test nanocomposites on different microorganisms.

References

1) Gilbertson, L. et. al. (2016). Shape-Dependent Surface Reactivity and Antimicrobial Activity of Nano-Cupric Oxide. *Environ. Sci. Technol.* 2016, 50, 3975−3984.
2) Faria, A. et. al. (2018). Elucidating the Role of Oxidative Debris in the Antimicrobial Properties of Graphene Oxide. *ACS Appl. Nano Mater.* 2018, 1, 1164−1174.

Acknowledgements

A special thanks to Francois Perreault for providing me with all the resources needed this spring and Ana Barrios for her support and assistance.

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