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Immobilization of Bacteriophages in a Calcium Alginate Biopolymeric Matrix for Biosorption of Hg^{2+} cations in Aqueous Medium

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INTRODUCTION & AIM

One of the major problems in the Amazon region is the illegal management of Hg(II). Unfortunately, this issue was not addressed before it affected local water sources, as well as the fauna and flora. In an effort to counteract this problem—which represents one of the greatest public health disasters, caused by the metabolization of this metal leading to its entry into the food chain and its disastrous consequences, such as neurodegeneration and fetal malformations—a mechanism was developed using bacteriophages for the adsorption of this metal from the aquatic environment. The bacteriophages used were of the T4 morphotype, immobilized in biopolymeric microparticles aiming at the biosorption of Hg^{2+} ions from the medium through their viral capsids. The results proved to be highly promising for the application of bacterial viruses in biomitigation processes.

METHODS

Scanning Electron Microscopy (SEM): To verify the size, shape, and morphology of the microparticles

Energy Dispersive X-ray Fluorescence (EDXRF): To verify the composition of the microparticles containing immobilized phage virions, through which mercury solutions with varying concentrations were percolated

RESULTS & DISCUSSION

The results proved to be very promising for the intended application, with the developed system exhibiting considerable performance in the biosorption process of mercury ions.

Figure 1. *Quantitative analysis of the microparticles with or without percolation of Hg(II) solution.*

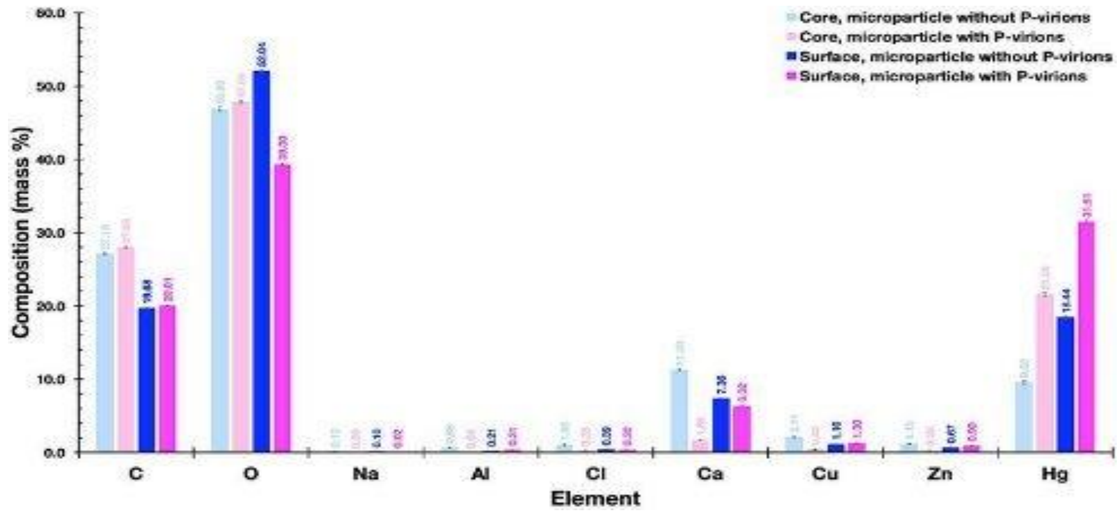
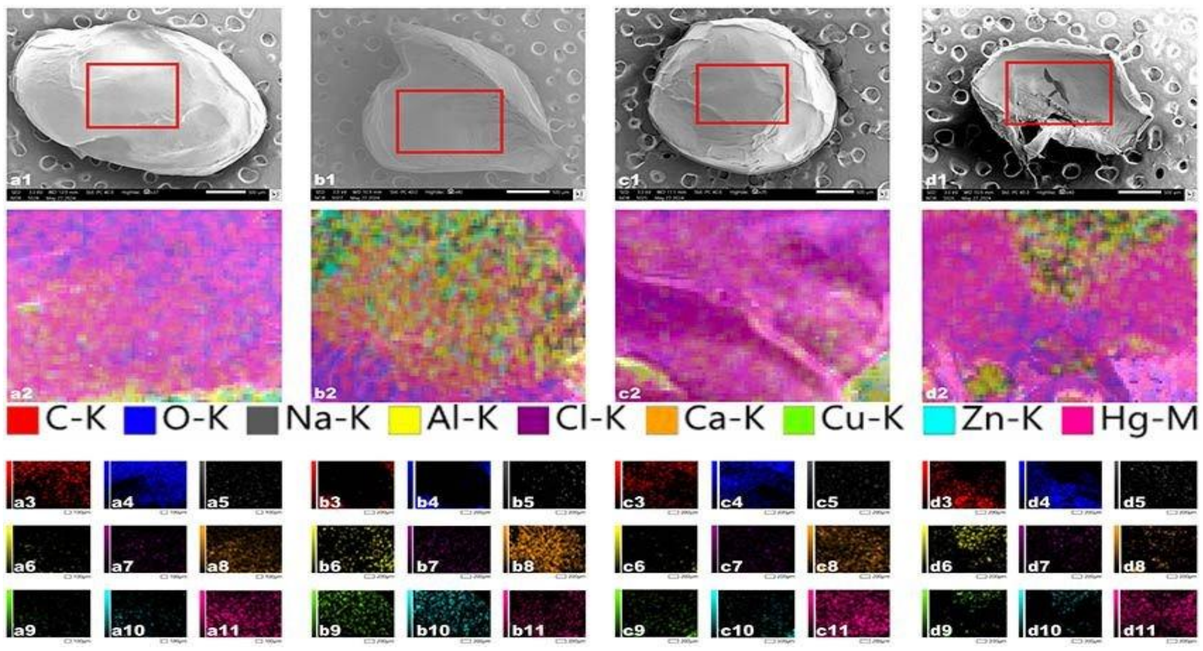


Figure 2. *EDS images of microparticles with and without phage virions after percolation of Hg^{2+} solutions at varying concentrations, with qualitative elemental analysis.*



CONCLUSION

Bacterial viruses have been studied as key agents in the process of biomineralization and for the ability of their capsids to biosorb metal ions (Pacton, 2014). The results obtained in this research are not only promising but also encouraging for the application of T4 morphotype bacteriophages in the biomitigation of heavy metal contamination in aquatic environments.

FUTURE WORK / REFERENCES

Current research focuses on testing the mechanism in different samples from Brazilian water sources.

Pacton, M., Wacey, D., Corinaldesi, C. *et al.* Viruses as new agents of organomineralization in the geological record. *Nat Commun* **5**, 4298 (2014). https://doi.org/10.1038/ncomms5298.

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