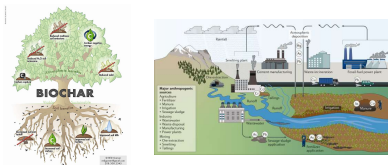


Study on the passivation effect of different types of biochar on soil heavy metals

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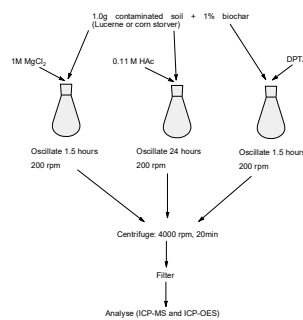
Introduction

Heavy metal contamination in soil is a significant environmental and ecological issue, particularly in agricultural regions like those in China. These metals, including As, Cd, Cr, Hg, Cu, Zn, and Ni, are toxic, persistent, and Widespread. Chronic exposure to them poses severe health risks to humans. Effective remediation strategies focus on changing the form of these metals to reduce their bioavailability and mobility. Technologies like immobilization and stabilization, especially using biochar, have shown promise in controlling soil pollution, enhancing soil fertility, and minimizing the harmful impacts of heavy metals on the environment and human health.



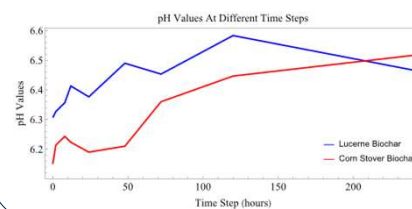
In this research project a closer look will be given at 2 different types of biochar (corn stover charcoal and lucerne biochar), and their passivation effect on the heavy metal contaminated soil

Method



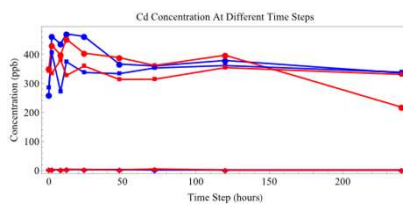
- 3 extractions;
- Every extraction has 3 repetitions;
- Samples are taken every:
 - 0h, 2h, 8h, 12h, 24h
 - 48h, 72h, 12h, 240h
- Analysis:
 - pH measurement
 - ICP-MS (very sensitive)
 - ICP-OES (less sensitive)

pH results

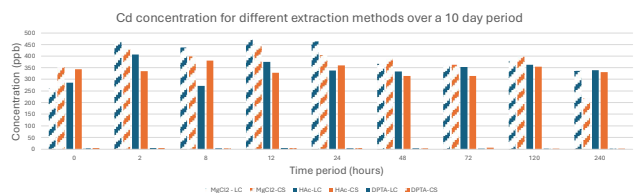


- Heavy metals are responsible for low soil pH
- pH rises over time
- Both types of Biochar have a positive influence on the soil pH

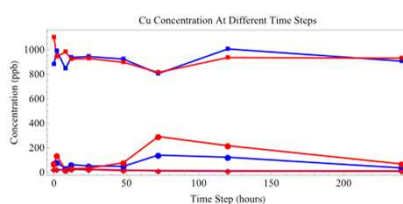
Cd Concentration



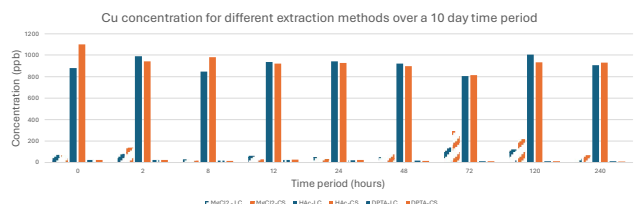
- MgCl₂-Lucerne biochar
- MgCl₂-Corn Stover biochar
- HAc-Lucerne biochar
- HAc-Corn Stover biochar
- DPTA-Lucerne biochar
- DPTA-Corn Stover biochar



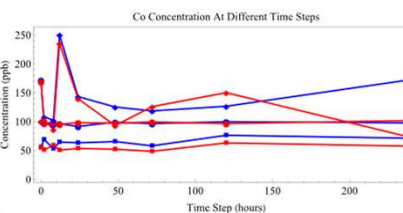
Cu Concentration



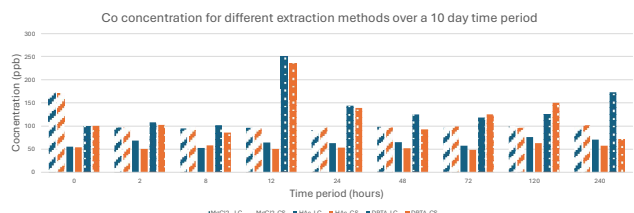
- MgCl₂-Lucerne biochar
- MgCl₂-Corn Stover biochar
- HAc-Lucerne biochar
- HAc-Corn Stover biochar
- DPTA-Lucerne biochar
- DPTA-Corn Stover biochar



Co Concentration



- MgCl₂-Lucerne biochar
- MgCl₂-Corn Stover biochar
- HAc-Lucerne biochar
- HAc-Corn Stover biochar
- DPTA-Lucerne biochar
- DPTA-Corn Stover biochar



Conclusion

- Extraction methods (linked to the phase the metal is found in):
 - Best extraction method for Cd (Exc., Car., Ox. State): MgCl₂ and HAc
 - Best extraction method for Cu (Ox. State): HAc
 - Best extraction method for Co (Exc. Car. Ox. State): MgCl₂, HAc, and DPTA
- Further research needed to determine the difference between Lucerne and Corn Stover biochar
- Results are not conclusive → longer time-period (ideally the concentrations should go down with time)
- pH measurements show promising results (rise in pH)

References

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- Lan, J., Zhang, S., Dong, Y., Li, J., Li, S., Feng, L., & Hou, H. (2021). Stabilization and passivation of multiple heavy metals in soil facilitating by pinecone-based biochar: Mechanisms and microbial community evolution. *Journal of Hazardous Materials*, 420, 126588. <https://doi.org/10.1016/j.jhazmat.2021.126588>

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