### **ARSENIC ADSORPTION IN IRON-IMPREGNATED BIOCHAR**

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# Background

Biochar, a **carbon-based** material with applications in **water treatment**, is produced through the **pyrolysis** of biomass in a no-oxygen environment at high temperatures [1]. Biochar's **large surface area** and **porosity** make it a promising candidate for water contaminant removal, but additional modifications such as **iron-impregnation** will further facilitate contaminant adsorption [2].

# Methodology

Iron Loading	<ul> <li>Oxidation w/ KMnO4 solution</li> <li>Iron-loading w/ FeSO4 solution</li> </ul>	
XRF Analysis*	<ul> <li>Biochar: buckthorn (1) &amp; waste wood (2)</li> <li>Determine iron content</li> </ul>	
Water Treatment	<ul> <li>Column test of treated and raw biochars</li> <li>Run until adsorption stops</li> </ul>	
ICP-MS Analysis**	<ul> <li>Water samples: before &amp; after biochar</li> <li>Acid-digested biochars</li> </ul>	Biochar being stirred in KMnO4 solution
	Iron Loading XRF Analysis* Water Treatment ICP-MS Analysis**	<ul> <li>Iron Loading</li> <li>Oxidation w/ KMnO4 solution</li> <li>Iron-loading w/ FeSO4 solution</li> <li>XRF Analysis*</li> <li>Biochar: buckthorn (1) &amp; waste wood (2)</li> <li>Determine iron content</li> <li>Water Treatment</li> <li>Column test of treated and raw biochars</li> <li>Run until adsorption stops</li> <li>Water samples: before &amp; after biochar</li> <li>Acid-digested biochars</li> </ul>

\*XRF- X-Ray Fluorescence \*\*ICP-MS- Inductively Coupled Plasma Mass Spectrometry

# Results



- Count of iron in treated biochar 1 was 3.4x that of raw biochar
- Count of iron in treated biochar 2 was 7x that of raw biochar

# **Conclusion & Future Work**

While the **water treatment** and **ICP-MS** analysis have not yet been completed, **XRF analysis** successful **iron loading** onto the raw biochar. It is hypothesized that this additional iron will play a pivotal role in the adsorption of arsenic in tap water. Unfortunately, this process is inaccessible for developing/rural communities. A future goal of this project is to develop an iron-loading method to treat biochar in areas where other lab-based processes are unavailable.

# References

[1] Gwenzi, W. et al. (2017). Biochar-Based Water Treatment Systems as a Potential Low-Cost and Sustainable Technology for Clean Water Provision. Journal of Environmental Management, 197, 732–749., doi:10.1016/j.jenvman.2017.03.087.

[2] Kilduff, J., Gerbini, A., Deede, B., Lennox, E., Martin, H., Desai, H., Arrighi, J., Sawicz, K., Raju, R., Komisar, S., Jovic, S., Gupta, S., Carley, V. (2007). Final Report: Providing Safe Water to Rural Nepal: A Novel Water Filtration System. United States Environmental Protection Agency.

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