Crab Shell Biochar as an effective means for removing copper from water

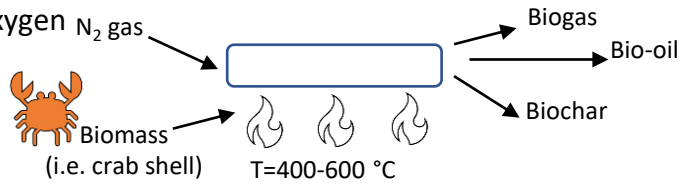
David Hopkins[1*], Stephanie MacQuarrie[2], & Kelly Hawboldt[1]
[1] Memorial University of Newfoundland, St. John's, NL, A1B 3V6
[2] Cape Breton University, Cape Breton, NS, B1P 6L2

Introduction

- Snow crab fishery is a major part of the Atlantic Canadian economy, generating over $772 million in 2018 [1]
- Processing by-product (30-50 wt% of catch) [2] contain valuable compounds that could improve economics and decrease environmental impact if recovered
- Potential Solution – pyrolysis!

Methodology

- Pyrolysis is a thermochemical process in absence of oxygen

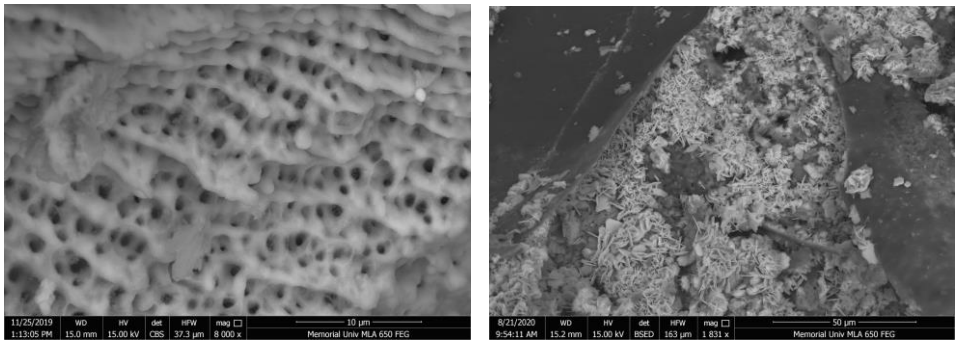


Conditions in our study were 500 °C and 100 mL/min N2

- Solid biochar is a potential adsorbent for for acid mine drainage (AMD) [3]
- In this study we characterize crab biochar and assess use as Cu^{2+} adsorbent in acidic-alkaline solution

Biochar Characterization

- Crab biochar is primarily calcite ($CaCO_3$), with pH of 11.75 and a specific surface area of 20.71 m^2/g, (pore size ranging from 3-10 nm)
- Other properties are similar to $CaCO_3$ already used for AMD
- Due to production temperature, biochar contains no viral/bacterial contamination



Left: Biochar pre-adsorption, Right: Biochar post Adsorption

Adsorption Results

- At a biochar dosage of 5 g/L, the crab shell biochar had an adsorption capacity of 184.8 mg/g (40-99% removal depending on concentration)
- Adsorption unaffected by initial pH, and biochar neutralizes acidic pH
- This adsorption capacity is much higher than other commercial adsorbents and other types of biochar [3,4]

Conclusion & Future Work

- Crab shell biochar is a highly effective metal adsorbent
- Future work needed to test mixed metal solutions
- Testing other product streams can improve feasibility

Acknowledgements

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References:

[1] DFO, Seafisheries landed value by region, **2018**. [2] L. Beaulieu et al., Bioresourc., Technol. **2009** 100(13) 3332, [3] X. Tong et al., Chem. Eng. J., **2011** 171(2-3) 828, [4] K. Wilson et al., Bioresourc. Technol. **2006** 97(18) 2266