Zinc and copper are regulated by industrial stormwater permits, which are becoming more stringent. Remediation methods must improve to meet permit levels. Currently, biochar is used with peat moss as an adsorbent in filters, however peat moss is not a sustainable material as it is mined in Canada.

**Purpose**
- Determine an alternate locally sourced biochar mixture to replace peat that has a comparable adsorption capacity for zinc and copper

**What is Biochar?**
- Organic matter heated to 1200 °C for 15 seconds in an oxygen limited environment to remove water and volatile species
- High amount of surface area to adsorb many ions

**Our Sponsor**
- John Miedema, owner of BioLogical Carbon, LLC
- makes biochar for stormwater remediation columns and soil amendments
- His previous research has shown biochar mixed with peat moss is more effective at adsorbing metal cations than biochar alone in packed bed column tests

**Biochar Mixtures Tested**
- 15 wt% solid humic acid
- 25 wt% solid humic acid
- 25% compost with 5% iron
- 25% bokashi
- Biochar soaked in 20 vol% acetic acid for 24 hours
- Biochar soaked in fulvic acid for 24 hours
- 25% peat
- Biochar

**Methods**
1. Mixture Preparation: Sieve and grind biochar mixtures
2. Batch Preparation: Create 50 mg mixtures using a mass balance and expose the mixtures to air for 24 hours to enhance microbial reactions
3. Batch Testing: Synthetic stormwater with zinc and copper concentrations of 0.5 ppm, 1 ppm, 2 ppm and 3 ppm were added to the bottles and tumbled for 48 hours.
4. Vacuum Filter samples
5. Use ICP-OES to determine final zinc and copper concentrations

**Results**

**Acid Soaked Mixtures - Copper**
- Adsorption capacity for acid soaked biochars were smaller than peat biochar mixture and biochar alone for both copper and zinc.

**Fermented Mixtures - Copper**
- Biochar and peat/biochar mixture had highest copper adsorption capacity

**Biochar and Peat/Biochar Mixtures**
- Peat mixture had highest zinc adsorption capacity.

**Conclusions**
- Compost, bokashi, and soaked biochar mixtures did not perform as well when compared to biochar alone.
- Biochar, 25 wt. % solid Humic acid and 25% Peat biochar mixtures have statistically similar removals.
- The next project phase could investigate column tests with biochar, 25 wt.% solid humic acid and 25% peat biochar mixtures.
- The team recommends copper, zinc and dissolved organic carbon concentrations to be measured during column testing.

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