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Synthetic Leaching Procedure for Soils

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joshua.padilla[1]
[1]USDA-ARS

joshua.padilla

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A standard protocol.

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Abstract

This is a protocol following the EPA's Synthetic Leaching Procedure (SLP) for soils. This method provides an estimate of rainfall-leachable ions from soils, particularly from those that are metal-contaminated.

Materials

50 mL centrifuge tube.
Disposable transfer pipette.
DI water.
Concentrated nitric and sulfuric acid.
Beaker with volume sufficient for your needs.
Stir plate.
Stir bar.
pH Meter.
Balance.

Troubleshooting

Safety warnings

This requires handling nitric and sulfuric acids.

Preparation of SLP acid mixture.

1 Add 2.4 g of H2SO4 and 1.6 g of HNO3 to about 30 mL of DI water in a graduated 50 mL centrifuge tube. Adjust the final volume to 40 mL. Add 1 mL of this to about 40 mL of DI water in a second graduated 50 mL centrifuge tube. Adjust the final volume to 50 mL. Wear proper PPE at all times.

Preparation of SLP extractant.

2 Calibrate a pH meter.

3 Fill a beaker with a volume of DI water sufficient for your needs. Add a stir bar to the beaker and place it on a stir plate. Insert the pH meter into the the DI water and turn the stir plate on.

4 Using a disposable transfer pipette, add your SLP acid mixture (step 1) dropwise to the stirring DI water. Add one or two drops at a time and wait for the pH reading to stabilize. If you are extracting soils from east of the Mississippi River, adjust the final pH to 4.2. For soils west of the Mississippi River, adjust to the final pH to 5.0. This should require 10-15 drops of the SLP acid mixture for about 1 L of extractant.

SLP Extraction

5 SLP extractions are done at a soil:solution ratio of 1:20. I typically use 2g:40 mL, however, for biochar screening experiments, I'll use 40g:800 mL in 1L bottles. Weigh soil into a properly sized vessel with a secure lid. Add SLP extract at a volume that is 20x the mass of soil. Cap the vessel and transfer to a platform shaker for **18 hours**. (I usually start these at 4:00 PM and take them off at 10:00 AM the next morning.)

6 Filter the liquid through a 0.45 um filter. This can be analyzed for solutes of interest according to the proper method.

Protocol references

EPA Method 1312. (1994). Synthetic Precipitation Leaching Procedure. https://www.epa.gov/sites/default/files/2015-12/documents/1312.pdf