

Total Suspended Solids in Water Samples

Environmental waters may contain a variety of solid or dissolved impurities. In quantifying levels of these impurities, suspended solids is the term used to describe particles in the water column. Practically, they are defined as particles large enough to not pass through the filter used to separate them from the water. Smaller particles, along with ionic species, are referred to as dissolved solids. In considering waters for human consumption or other uses, it is important to know the concentrations of both suspended and dissolved solids. The most common pollutant in the world is “dirt” in the form of TSS.

First, let's consider some implications of total suspended solids (TSS).

-High concentrations of suspended solids may settle out onto a streambed or lake bottom and cover aquatic organisms, eggs, or macro-invertebrate larva. This coating can prevent sufficient oxygen transfer and result in the death of buried organisms.

-High concentrations of suspended solids decrease the effectiveness of drinking water disinfection agents by allowing microorganisms to “hide” from disinfectants within solid aggregates. This is one of the reasons the TSS, or turbidity, is removed in drinking water treatment facilities.

-Many organic and inorganic pollutants sorb to soils, so that the pollutant concentrations on the solids are high. Thus, sorbed pollutants (and solids) can be transported elsewhere in river and lake systems, resulting in the exposure of organisms to pollutants away from the point source.

Lab Procedures:

Preparing your filters

1) Rinse three filters with 20-30 mL DI to remove any solids that may remain from the manufacturing process. Place the filters in separate, labeled aluminum weight pans, dry them in a 104°C oven for 30 minutes, place them (filter and pan) in a desiccator, and obtain a constant weight by repeating the oven and desiccation steps.

Obtaining the TSS measurement

2) Filter 100.mL of sample through each pre-weighed filter.

- 3) Place each paper in its aluminum weight pan in the 104°C oven for 1 hour. Cool the filter and pan in a desiccator and obtain a constant weight by repeating the drying and desiccation steps. (This step will be completed after your normal lab meeting time.)

Calculation:

$$\text{TSS mg/L} = \frac{(\text{average weight from step 3 in g} - \text{average initial weight from step 1 in g})(1000\text{mg/L})}{\text{sample volume in L}}$$

Hints for success:

- Always, ALWAYS completely mix your sample before removing any solution/suspension. The soil/sediment particles will settle and bias your results if you do not completely mix the sample every time you remove an aliquot.
- Perform all measurements in triplicate.
- Carefully clean all containers and pre-wash all filters with DI water prior to use. As the procedures notes, you must heat filters to the maximum temperature that you will use experimentally, before filtering. Also as noted in the procedures, you must obtain a constant weight (generally within 0.5 mg) before you end each experiment. (Fingerprints and dust weigh enough to significantly affect your results.)
- Your balances have been calibrated, but for best results you should still use the same balance for every measurement. Even if the calibration on a balance is slightly off, the change in weight will probably be accurate.