

Elemental analysis (EA)

Measurement of total carbon, total nitrogen, and total sulfur (TC, TN, TS) may be made on single samples using an elemental analyzer. The Core Facility typically refers researchers to the Large Lakes Observatory, University of Minnesota – Duluth for this type of analysis (contact Yvonne Chan, ychan2@d.umn.edu), but many other institutions have EAs too.

One consideration in elemental analysis is that the procedure generates a number for *total* carbon, which includes both organic and inorganic forms of carbon. Typically TN and TS are plotted vs. total *organic* carbon, so if there is any inorganic carbon (i.e., carbonate minerals such as calcite, dolomite, etc), it must also be quantified and subtracted from total carbon to give percent total organic carbon ($TC - TIC = TOC$).

Two main options exist for quantification of total inorganic carbon: the first is to prepare the EA sample by acidifying it to dissolve carbonates, thus guaranteeing that all carbon is organic. Problems with this method include (1) the possible conversion of C, N, and S species to different forms, and their subsequent loss by washing or gas evolution; (2) the uncertainty in time necessary to dissolve all carbonate, as some forms (e.g., dolomite) are more resistant than others. The Core Facility prefers quantification by [TIC coulometry](#), which is a separate analytical step but only uses 10-50 mg of dry sediment and preserves the bulk sediment for accurate CNS analysis.