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AN EVALUATION OF THE EFFECT OF SAMPLE PROCESSING TREATMENTS ON ALKALINITY MEASUREMENTS OF GROUND WATER FROM A PIEDMONT REGION

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The accurate measurement of alkalinity of groundwater samples has been a source of methodological disagreement. PCO₂, charge balance, and carbonate speciation calculations are dependent on an accurate measurement of alkalinity. Using Gran titration as the standard method for measuring alkalinity, our previous results showed that sample processing methods (filtered/unfiltered, refrigerated /unrefrigerated) had no statistically significant effect on alkalinity concentrations measured in samples from dilute streams flowing over silicate metamorphic rocks and samples from streams flowing over limestone and dolomite, but undersaturated with respect to calcite. The purpose of this study was to determine whether variation in processing methods leads to statistically significant differences in alkalinity concentrations in groundwater collected from a piedmont region.

We collected one 16 L sample and twelve 125 mL samples from a 2.5 m deep well in the Brushy Creek watershed, South Carolina. All samples were collected with zero head space to limit the loss of CO₂. Aliquots from the samples were collected in triplicate using four processing treatments: filtered/refrigerated, filtered/unrefrigerated, unfiltered/refrigerated, and unfiltered/unrefrigerated. All aliquots were analyzed within 24 hrs using the Gran Titration method. The mean alkalinity concentration was 32.09 +/- 4.22 mg/L and PCO₂ values were >650 times higher than all but one surface water sample. Two-way ANOVA results indicate that there were no statistically significant differences among the various treatments. The alkalinity concentrations of all samples will be measured again after 30 days to determine if storage time affects alkalinity. Previous analyses of surface waters indicate that storage of samples does not affect alkalinity, but this may not hold true for groundwater so supersaturated with respect to carbon dioxide.

We will replicate this experiment with samples from additional wells to test the generality of our findings. Our current recommended treatment for groundwater is to filter and refrigerated the sample and to measure alkalinity within 24 hrs to maintain the chemical integrity of the sample.

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