

Table 7.5. Acid-Base Accounting data for the Brush Creek Shale.

NP Sobek	NP Skousen	%S
96.97	49.68	0.59
96.96	49.31	0.59
96.98	47.61	0.56
96.97	47.07	0.59
<b>Ave 96.97</b>	<b>Ave 48.42</b>	<b>Ave. 0.58</b>

The following steps illustrate how carbonate dissolution rates were determined.

Step 1. Determine the amount of calcium carbonate (equivalent) in the column.

Using the Average NP number (Table 7.5) and the known mass of sample in a column, the amount of calcium carbonate equivalent can be computed for the material in that column. For example, Lab 5's Brush Creek Shale, Column 1 contained 1879.2 grams of material. The units for NP are tons/1000 tons CaCO<sub>3</sub> equivalent. The amount of calcium carbonate equivalent contained in the column can be computed as follows:

$$1879.2 \text{ grams} \times (48.42/1000) = 91.0 \text{ grams CaCO}_3 \text{ equivalent.}$$

Thus, this column contains the carbonate equivalent of 91 grams CaCO<sub>3</sub>. This number will be used later to determine weathering rate.

Step 2. Determine the amount of calcium carbonate weathered each week. This is done by determining the mass of the weathering products produced each week in the leachate. There are two ways this can be done, the "cation approach" and the "anion approach" discussed below.

Step 2a. *The "Cation" Approach*

The Cation Approach involves computations using the two cations that are commonly associated with acid-neutralizing carbonates, namely calcium and magnesium. These are evaluated in terms of calcium carbonate equivalent by summing Ca as CaCO<sub>3</sub> and Mg as CaCO<sub>3</sub>. Three assumptions are made:

- (1) all Ca and Mg in solution are derived from carbonate dissolution,
- (2) Ca and Mg have not been lost from the solution and retained in the column, and
- (3) gypsum is not present in the material being leached.

If gypsum is present, then there is calcite from a source that is not directly related to carbonate dissolution. Thus, the calcium carbonate dissolution rate can not be accurately determined, unless one determines the amount calcium from gypsum dissolving per week and subtracts this portion.