## ALKALINITY

Alkalinity, the quantitative capacity of a solution to react with an acid to a designated pH, is determined by titration with a standard acid. The endpoint can be determined either potentiometrically or by use of an indicator, such as phenolphthalein, methyl orange, or methyl red.

Alkalinity is usually expressed as milligrams per liter (mg/L) or parts per million (ppm) calcium carbonate and is assumed to be due to carbonate, bicarbonate, and hydroxide, although phosphates and borates may contribute. The color change of phenolphthalein, between pH 8 and 9, is used to indicate the P alkalinity. The color change of methyl red, between pH 4 and 5, is referred to as T alkalinity. Some prefer to use methyl orange, which changes color between pH 3 and 4 and is designated as M alkalinity. Normally there is little significant difference between T and M alkalinity.

When the P and T alkalinities have been determined, the relative content of hydroxide, carbonate, and bicarbonate (assuming no other substances to be present) can be estimated by the following scheme:

If P equals 0, all the alkalinity is T and is due to bicarbonate. There is no carbonate and no hydroxyl alkalinity.

If the fraction P/T is less than 1/2, there is no hydroxyl, the carbonate equals 2P and the remainder is bicarbonate (T-2P).

If the fraction P/T equals 1/2, all the alkalinity is due to carbonate. There is no hydroxyl and no bicarbonate. Carbonate equals 2P.

If the fraction P/T is greater than 1/2, the hydroxyl content is equal to 2P-T and the remainder is carbonate. There is no bicarbonate. Carbonate equals 2(T-P).

If the fraction P/T equals 1 (P and T alkalinity are the same), all the alkalinity is due to hydroxyl.

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