Resistivities of Solutions

Gen

Actual resistivity measurements are always preferred, but if necessary, the chart on the opposite page may be used to estimate the resistivity of a water sample at a given temperature when the salinity (NaCl concentration) is known, or to estimate the salinity when resistivity and temperature are known. It may also be used to convert resistivity from one temperature to another temperature.

Example: Resistivity of a water sample is 0.3 ohm-m at 25°C; what is the resistivity at 85°C?

Enter the chart with 25°C and 0.3 ohm-m. Their intersection indicates a salinity of approximately 20,000 ppm. Moving along this constant salinity line yields a water sample resistivity of 0.13 ohm-m at 85°C.

The resistivity of a water sample can be estimated from its chemical analysis. An equivalent NaCl concentration determined by use of the chart below is entered into Chart Gen-9 to estimate the resistivity of the sample.

The chart is entered in abscissa with the total solids concentration of the sample in ppm (mg/kg) to find weighting multipliers for the various ions present. The concentration of each ion is multiplied by its weighting multiplier, and the products for all ions are summed to obtain equivalent NaCl concentration. Concentrations are expressed in ppm or mg/kg, both by weight. These units are numerically equal.

For more information see Reference 2.

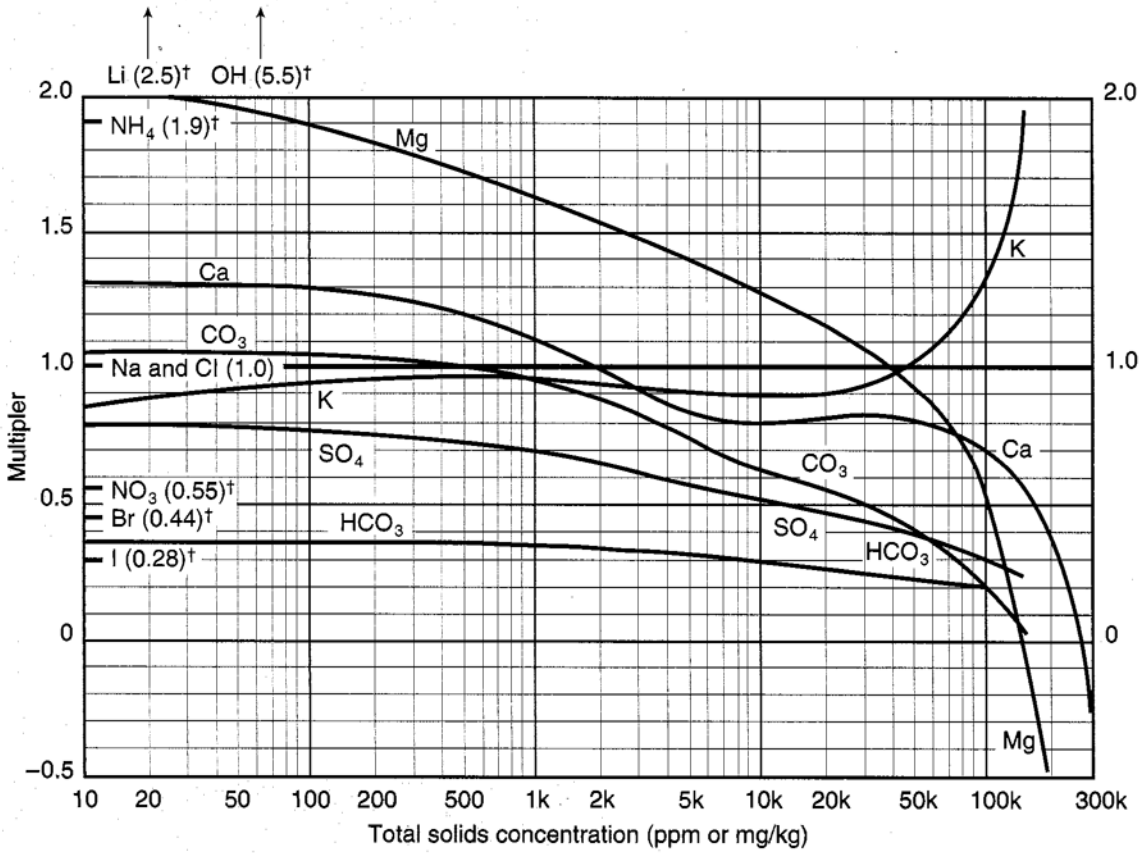
Example: A formation-water sample analysis shows 460 ppm Ca, 1400 ppm SO_4 and 19,000 ppm Na plus Cl.

Total solids concentration is 460 + 1400 + 19,000 = 20,860 ppm.

Entering the chart below with this total solids concentration, we find 0.81 as the Ca multiplier and 0.45 as the SO_4 multiplier. Multiplying the concentration by the corresponding multipliers, the equivalent NaCl concentration is found as approximately

$460 \times 0.81 + 1400 \times 0.45 + 19{,}000 \times 1 \approx 20{,}000$ ppm.

Entering the NaCl resistivity-salinity nomograph (Gen-9) with 20,000 ppm and 75°F (24°C), the resistivity is found to be 0.3 at 75°F.



† Multipliers that do not vary appreciably for low concentrations (less than about 10,000 ppm) are shown at the left margin of the chart

Resistivity of NaCl Solutions

Conversion **approximated** by $R_2 = R_1 [(T_1 + 6.77)/(T_2 + 6.77)]°F$ or $R_2 = R_1 [(T_1 + 21.5)/(T_2 + 21.5)]°C$