Introduction to Salinity

Mechanical Engineering Department
Portland State University
Overview

• Measures of mixtures
  Concentration
  Mass fraction

• Exercises in mass fraction
Measures of Salt Proportions

Chemists usually refer to *Concentration*

\[ C = \frac{\text{mass of salt}}{\text{Volume of salt water}} \]

We will use *Mass fraction*

\[ \text{Mass fraction} = \frac{\text{mass of salt}}{\text{total mass of mixture}} \]
Mass Fraction and Weight Fraction

\[
\text{Mass fraction} = \frac{\text{mass of salt}}{\text{total mass of mixture}} = \frac{m_{\text{NaCl}}}{m_{\text{NaCl}} + m_{\text{H}_2\text{O}}}
\]

where \( m_{\text{NaCl}} \) is the mass of salt in the mixture, and \( m_{\text{H}_2\text{O}} \) is the mass of water in the mixture.

\[
\text{Weight fraction} = \frac{\text{weight of salt}}{\text{total weight of mixture}} = \frac{(m_{\text{NaCl}}) \, g}{(m_{\text{NaCl}}) \, g + (m_{\text{H}_2\text{O}}) \, g}
\]

Since the factors of \( g \) cancel,

\[
\text{Mass fraction} = \text{Weight fraction}
\]

These quantities are \textit{numerically} equivalent. Both the \textit{mass fraction} and \textit{weight fraction} are \textit{dimensionless} ratios.
Weight Percent Salt

Often the mass fraction (or weight fraction) is expressed as *Weight percent* or *wt %* or *wt pct*

*Percent* is just a dimensionless fraction multiplied by 100.

Therefore

\[ \text{wt % salt mixture} = \text{mass fraction} \times 100 \]
Practice

1. What is the *weight percent* salinity of a mixture of 1 g of salt in 1 L of pure water?
2. How much salt (in grams) is in a gallon of 0.015 weight percent saltwater mixture? What is the mass fraction of salt in the mixture?