Basic Assumptions of Ideal Gas Model

• The thermodynamic properties: pressure, specific volume (or density) and temperature are related by the equation of state

\[ pv = RT \]  \hspace{1cm} \text{(where } R \text{ is the specific gas constant)}

• The specific internal energy depends only on temperature, \textit{i.e.}

\[ u = u(T) \]

• What is the implication on enthalpy?

\[ h = u + pv = u + RT = h(T) \]

• Molar mass of an ideal gas is identical to the molar mass of the actual substance

• Common example: air under atmospheric conditions

• \textbf{Additional assumption:} constant specific heats (\textit{perfect gas})
Basic Assumptions of Incompressible Substance Model

• The density (and specific volume) of the substance is a constant.

• The specific internal energy depends only on temperature, i.e.
  \[ u = u(T) \quad \Rightarrow \quad \Delta u = c\Delta T \]

• Molar mass of an ideal gas is identical to the molar mass of the actual substance

• What is the implication on enthalpy?
  \[ h = u + pv \quad \Rightarrow \quad \Delta h = \Delta u + v\Delta p = c\Delta T + v\Delta p \]

• Common example: water under atmospheric conditions