**CL201**
**Semester 1 2016-17**
**ASSN11 - Part 2**
**5/11/2016**

**Name:** Akash Pallath
**Roll No:** 15110008

## Enthalpy of Vaporization

The specific enthalpy change $\Delta\hat{H}_v$ associated with the phase transition of a substance from liquid phase to vapor phase at a given pressure is known as the (specific) enthalpy of vaporization of the substance at that pressure.
The *standard* enthalpy (or heat) of vaporization of a substance is the enthalpy of vaporization at the normal boiling point of the substance.

While calculating the change in enthalpy for a process involving a phase change from liquid to vapor phase, the enthalpy of vaporization must be taken into account at the point where the process crosses the saturated vapor line (into the gaseous phase). In many processes that one may encounter, it may happen that the phase change occurs at a temperature (or pressure) other than that for which the enthalpy of vaporization is available in known databases.
In these cases, we can use the fact that enthalpy is a state function (property) of a thermodynamic system, and does not depend upon the process path. In order to calculate enthalpy change associated with such a process, we can then choose a *hypothetical* process path maintaining the same initial and final states, such that the process path crosses the saturated vapor line on the P-V phase diagram at a point for which the value of $\Delta\hat{H}_v$ is available.

There are many different formulae available for estimating the enthalpy of vaporization of a substance. One such way is based on an equation we have learned in class - the Clausius - Clapeyron Equation,

$$\ln p* = -\frac{\Delta\hat{H}_v}{RT} + B$$

which is used to estimate vapor pressure. Given vapor pressure data, we can use a plot of $\ln p*$ v/s $\frac{1}{T}$ to estimate the value of the enthaply of vaporization $\Delta\hat{H}_v$, assuming that it remains constant for the range of data that we have. However, for this, we must have many accurate data points within a small range.

### References

1. CL201 Lecture Notes
2. Felder R. and Rousseau W., *Elementary Principles of Chemical Processes 3e.*, Wiley, 2014