Program Bachelor of Science.First year Subject : Industrial chemistry Semester two ,Course code CHD 151. Course title: General industrialChemistry Title of the unit: energy balance and industrial operations.

Module name: Enthalpy changes upon dissolution of solids in Liquid's Part 2.

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The outline is adiabatic process phase change processes and latent heat.

The learning outcome is adiabatic process.phase change processes, concept of latent heat .

Adiabatic process. It is defined as the process where the heat does not enter or leave the system.

This means the system does not absorb heat from the surrounding, nor does it give heat to the surroundings.

Adiabatic reactions. These reactions take place without loss or gain of heat when the adiabatic reaction is exothermic.

A temperature of the product stream increases when the adiabatic reaction is endothermic temperature of the product stream decreases .

Phase change process.Phase changes such as fusion.which is a melting process where the solid phase is converted to a liquid phase.

Vaporisation where it's a boiling process.

The liquid phase is converted into a gaseous phase, and condensation are accompanied by a large change in enthalpy.

When matter undergoes a phase change that is vapor to liquid or liquid to solid,etc, the enthalpy changes associated with unit amount of matter at constant temperature and pressure is known as latent heat of phase change,

Latent heat of fusion :Latent heat of fusion is the heat required to melt a unit amount of solid to liquid or heat removed to convert an unit amount of liquid into a solid state at constant temperature and pressure.

When a solid melts and changes to a liquid state. It absorbs heat and the enthalpy of the system increases.

So water in the solid states gave us water in the liquid state and the heat of enthalpy of fusion is + 6.02 kilo joules per mole

When the reverse reaction takes place.that is, when a liquid phase to a solid state indicates heat and the enthalpy of the system increases.

So water in the liquid states gives you water in the solid state.

The delta H value is equal to minus 6.02 kilo joules per mole.

In both these reactions, the value remains the same, only the sign changes.

The latent heat of sublimation,

latent heat of sublimation. It is the heat required to vaporize an unit amount of solid at constant temperature and pressure. Sublimation is a process of changing a solid substance into a gas without passing through a liquid phase.

The heat of sublimation is greater than the heat of vaporization.

Heat of sublimation is useful in determining.

The effectiveness of medicines as medicines are obtained in a pill or solid form can undergo sublimation.

That is, it can vaporize.

Latent heat of vaporization, latent heat of vaporization.

It is the heat required to vapourise an unit amount of liquid at constant temperature and pressure.

Or it is the amount of heat removed to condense an unit amount of vapor into liquid at constant temperature and pressure.

When a liquid evaporates to gaseous state, it absorbs heat from the surrounding and the enthalpy increases.

water in the liquid state gives you water in the gaseous state, so heat of vaporization is plus 40.7 kilo joules per mole.

when vapour condenses to a liquid state, heat is given out and the enthalpy decreases.

So what are indications?

Vapour State gives you water in the liquid state.Delta H is minus 40.7 kilo joules per mode.

Here both the reactions are reversible reactions.

So the value remains the same, only the sign changes.

Latent heat of vaporization is also that during vaporization, the system absorbs energy and the process is endothermic.

Example, when water evaporates, energy is required for the water molecules to overcome the forces of attraction and convert to vapor state, but during condensation there is release of energy, hence it is an exothermic process.

The latent heat absorbed.during vaporization is released during condensation.

The higher value of enthalpy of condensation or water vapor indicates that steam is more effective heating medium than boiling water and is more hazardous.

Expression of latent heat latent heat is given by the following expression

L is equal to Q upon M

Where L is the specific latent heat of a substance.Q is energy released or absorbed during a phase change.

M is the mass of the substance.

Latent heat is expressed in kilocalories, per kilogram or joules per kilogram.

This is a diagram in which.the X axis is heat supplied,Y axis is temperature.

It's a figure showing latent heat of fusion and latent heat of vaporization, as the heat supplied is increased, the temperature is increased.

As the substances in the solid state.but at one particular temperature, the solid is converted into the liquid state.

This is termed as latent heat of fusion, and the temperature is the melting point of the substance.

Further, when the heat supplied is further increase, the substances in the liquid state, and when the liquid state is being converted into the gaseous state at one particular temperature, the temperature is termed as the boiling point of the substance and the process is latent heat of vaporization.

So here the substance is completely converted into the gaseous state.Steam.

Then we have the example of steam which is obtained when water is boiled,

the energy absorbed is used to expand water molecules known as water vapour.

Second, when water is put in ice tray and placed in a freezer, it gives off energy and becomes solid ice. This energy is removed by the freezer system to keep it cold.

The Third Point,water vapor, is a greenhouse gas which is present in the atmosphere and it is important for the cloud formation.

If the air is dry, there is no formation of clouds, but if the air is moist, the water vapor.condenses to form clouds, hence, in order to get the formation of clouds, they should have moist air, where in there is presence or water vapor.and this water vapor further condenses to form clouds.

Now we have the references,

that is UGC study material for industrial chemistry by Mhatre,Narkar and Pathak. College Industrial Chemistry by Himalaya publishing house, then industrial chemistry by Sharma and principles of physicalchemistry by Puri Patania and Sharma.

Thank you.