Re: what is the evaporating temperature of water?

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On Dec 8, 12:07 am, bhargava <bhargava.pra...@xxxxxxxxx> wrote:

> hi,
> water evaporates from its bodies (likes ocean, river etc..) at
> temperatuer of 30 and odd degress of temp, but where as in boiling it
> doesn't even evaporate at 100 C(celcius). Why is this so?Then, What
> determines the evaporating temperature of water?
> Hope you got the question.
> thanks

A liquid's surface always evaporates. Boiling occurs when the external pressure (usually gravity plus atmospheric pressure) is lower than the saturated pressure of the liquid.

Saturated pressure is in turn the pressure that corresponds to 100% RH, or a steady state condition in which the number of molecules diving back into the surface per unit time is equal to the number of molecules evaporating from it per the same unit time.

When this equilibrium doesn't exist, for instance when RH above the surface is less than 100%, then the evaporation becomes visible in that the water level will gradually drop. There will be more molecules escaping than returning.

Above the surface the RH can be much less than 100% RH, but under the surface RH is always at 100%. Water is thus always at saturation within its own surfaces and thus always exerts an outward saturated pressure on itself equal to saturated pressure. When the external pressure is greater than saturated pressure, then the water is prevented from expanding as it wants to. By heating the water to boiling temperature the internal outward vapor pressure equals the atmospheric pressure pushing back down on it, and the tendency of the water to expand is no longer countered. We see this as boiling. Evaporation from the surface was occurring the whole time, even before boiling temperature and/or pressure was reached, and continues to occur after boiling starts.

The difference in evaporation rate is due to the fact that the total

surface area of the water, when it is boiling, is immensely increased. Every bubble provides a surface in addition to the surface on top of the water. The number of molecules escaping is thus increased exponentially, and evaporation is amplified proportionately. Boiling and evaporation are thus not interdependent phenomena. A sealed jar of water with no air in it, but having a pocket above the surface containing only water vapor, can be made to boil by simply dropping it, which removes the gravitational pressure, which in turn upsets the equilibrium within the jar.

As a final note, just to help minimize further confustion, RH (relative humidity) has nothing to do with the amount of water that the "air can hold," even though it is common practice to speak of it in those terms. In reality RH is just a proportional measure of the partial vapor pressure to the saturated vapor pressure, and ideally this is independent of any other gasses present or not present in the space above the water.

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