

### Compressed Liquid and Saturated Liquid

If we consider a piston-cylinder device containing water at 20 °C and 1 atm. Under these conditions water is in liquid form. Liquid form of water is called compressed liquid or subcooled liquid.

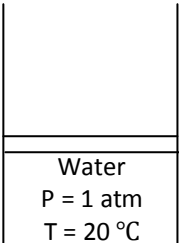


Figure 1. Compressed liquid

When we start to increase the temperature of water, the specific volume of water increases but it's still in the liquid phase. To accommodate this expansion, the piston will move up slightly.

When we continue to heat transfer, the temperature will keep rising until it reaches 100 °C. In this point water is still in liquid form but any heat addition will cause a phase change. A phase changing point (liquid to vapor) is called a saturated liquid form.

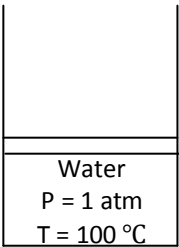


Figure 2. Saturated liquid

Once the vaporization process begins, temperature rising will stop until all of the liquid is vaporized. This means temperature remains constant during the phase changing processes. When all of the liquid water is vaporized but temperature is not changing. At this point all of the water is in vapor form but any heat loss causes a phase change again. We call this saturated vapor.

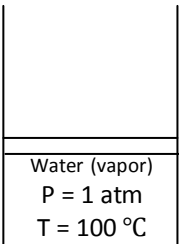


Figure 3. Saturated Vapor

Any point between saturated liquid and vapor. We called these type of water is saturated mixture. In saturated mixture form of liquid and vapor water will coexist in equilibrium.

A vapour that is not about to condense condition (temperature higher then 100 °C) is called superheated vapor.

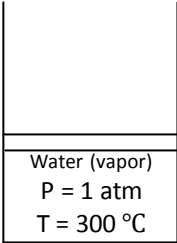


Figure 4. Superheated Vapor

If the entire process and reversed form shown in T – v diagram for specific pressure value we easily decide water phase at specified conditions.

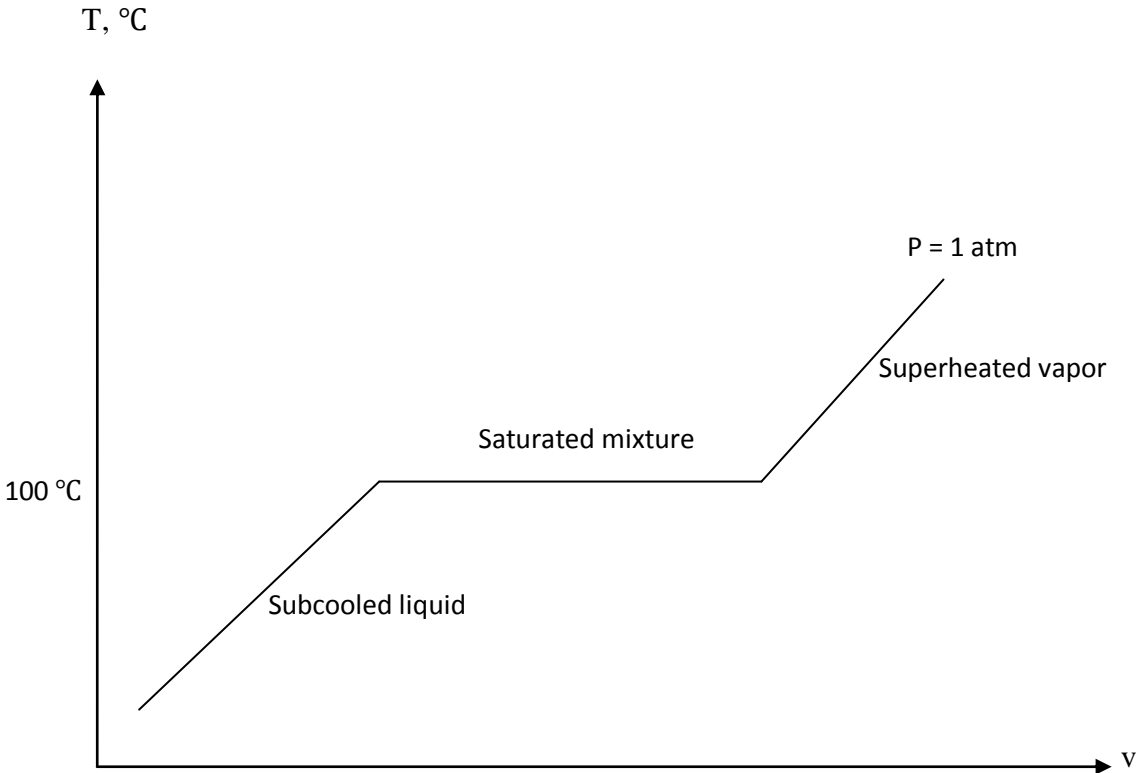


Figure 5. T – v diagram of water phases.

## Saturation Temperature and Saturation Pressure

At a given temperature, the pressure which a pure substance change phases is called the saturation pressure.

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$P_{\text{sat}}$ , ka

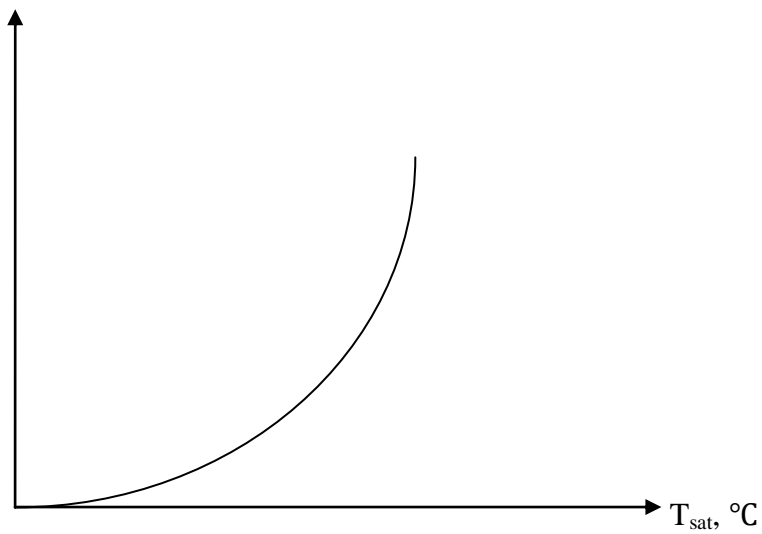


Figure 6. The liquid – vapor saturation curve of a pure substance.