- Ultimate tensile strength refers to the force needed to fracture the material.
- Tensile strength or ultimate strength is the maximum point shown on the stress-strain curve.
- Tensile strength is a measure of the strength and ductility of a material.
- Tensile strength value is commonly taken as a basis for fixing the working stresses especially brittle materials.

4.5.1 Tensile Test

Tensile test are being carried out to fined the mechanical properties of material. Samples are prepare generally according to the ASTM standards and located in a UTM machine.

1. Once the stress goes beyond the yield strength there will be decrease in cross sectional area. Hen increase is stress.
2. This increase in stress is compensated by increase in strength by work hardening.
3. A unique neck will appear at a point of plastic instability where the increase in strength due to wa hardening fails to compensate for the decrease in cross-sectional area.

Gradually the sample fail like cup and cone fractures.

4.5.2 Yield Point Phenomenon

- Carbon in iron is an interstitial impurity but the interstitial space is much smaller than size of carbo atoms. So by the process of diffusion, carbon get accumulated at the dislocation site it is calle cattrell atmosphere.

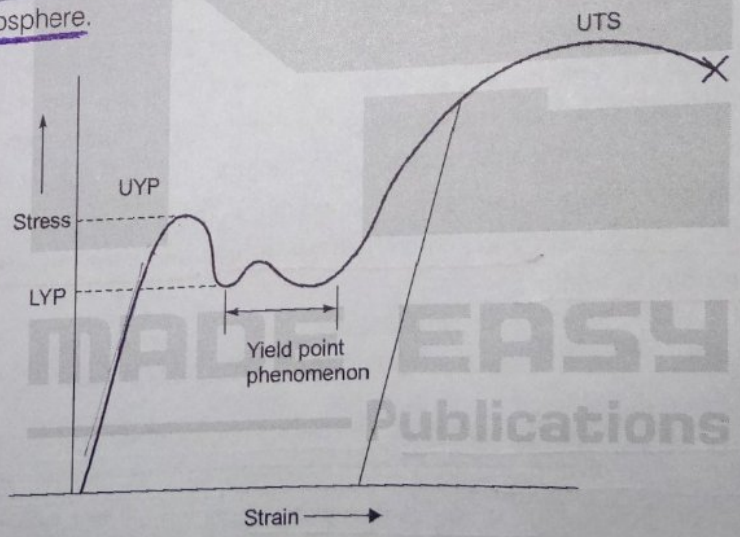

Figure 4.1 Yield Point Phenomenon

- This produces lattice strains. So extra stresses are required to break this cattrell atmosphere an jump the dislocation to the new site. That is why upper yield point appears.
- Once the dislocation jumps to the new position since there is no cattrell atmosphere lesser stress a required to keep the dislocation moving so lower yield point and yield point phenomenon appears the low carbon steel material.

4.6 Yield strength

- When metals are subjected to a tensile force, they stretch or elongate as the stress increases. Th point where the stretch suddenly increases, is known as the yield strength of the material.

- Yield strength of a material represents the stress below which the deformation is almost entirely elastic.
- Yield strength is that value of stress at which a material exhibits a specified deviation from proportionality of stress and strain.
- The ability of a material to resist plastic deformation is called the yield strength and is calculated by dividing the force initiating the yield by the original cross-sectional area of the specimen.
- In materials where the proportional limit or the elastic limit is less obvious, it its common to define the yield load as that force required to give 0.2% plastic offset. In other words, the yield strength is defined as the stress required to produce an arbitrary permanent deformation. The deformation most often used is 0.2%.

4.6.1 Yield Point Phenomenon

- Carbon is interstitial impurity in iron.
- But the size of interstitial nod is much smaller than carbon atom. So carbon diffuses through atom structure and gets accumulated to dislocation site.
- Thus a carbon rich atmosphere is produced called "Cottrel atmosphere".
- These cottrel atmosphere (produces atomic strains) in the host iron atoms, as when external load is applied on the material larger stresses are required to break the cottrel atmosphere.

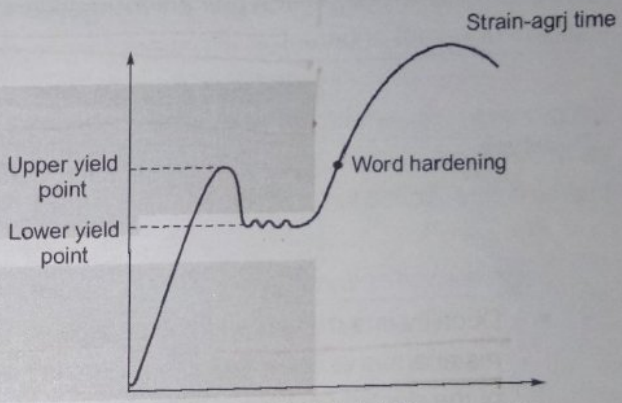

Figure 4.2 Yield Point Phenomenon

- That why upper yield point appears in the materials.
- One the dislocation jumps the new site relatively lower stress are required to keep the dislocation moving.
- That's why lower yield point appears in the material.
- Upon unloading the material from the region of work hardening and loading again yield point phenomenon will not appear.
- After a certain period (2 years) yield point phenomenon repeats and the period after which the process re appears in material is called strain aging time.
- These phenomenon does not appear in medium and high carbon steels because carbon is not only present at dislocation site but on the other inlets, site as well. So once dislocation jumps to new position, carbon is already there to diffuse.

4.7 Impact strength

- Impact strength is a complex characteristic which takes into account both toughness and strength of a material. The capacity of a material to resist or absorb shock energy before it fractures is called its impact strength.
- Impact strength depends upon the structure of a metal. Course grain structure and precipitation of brittle layers at the grain boundaries do not appreciably alter the mechanical properties in static tension, but they substantially reduce the impact strength. Impact strength is sensitive to rate of loading and to temperature, as well as to stress raisers (e.g., notches).