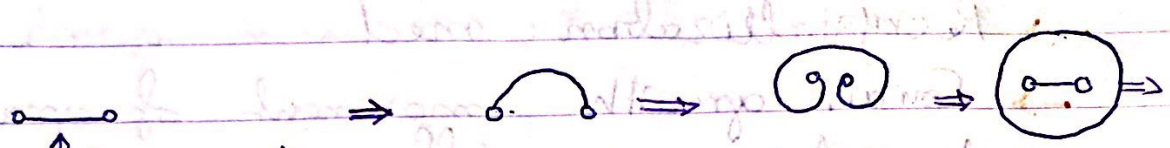
→ Chapter 7: Strain hardening & Annealing

Cold working ↑ ↑ Hot working

Frank-Reed source :-



Pinned segment

↳ 

Each time a new loop is forming

* Colid Working :-

Rolling

Forging

Extrusion

& tamping

Wire drawing

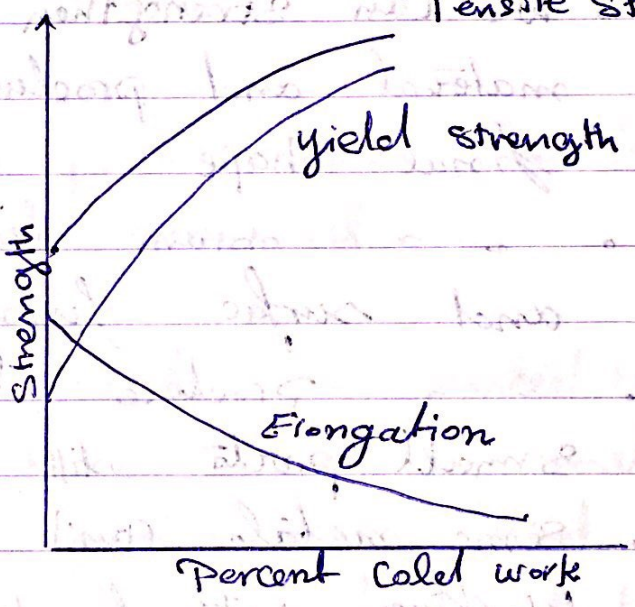
- Annealing (Hot working)

Stages :-

→ Recovery : low - Temp annealing heat treatem
→ Recrystallization : med - " " "
→ Grain growth : movement of grain boundries by diffusion

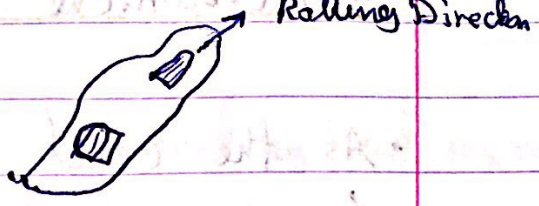
The effect of cold work on the mechanical properties of copper

- As the cold work ↑, the yield and tensile strength ↑ and Ductility ↓
- The metal breaks if more cold work is attempted.



Slide 20: During plastic deformation using cold or hot working, a microstructure of grains that are elongated in the direction of the applied stress is often produced

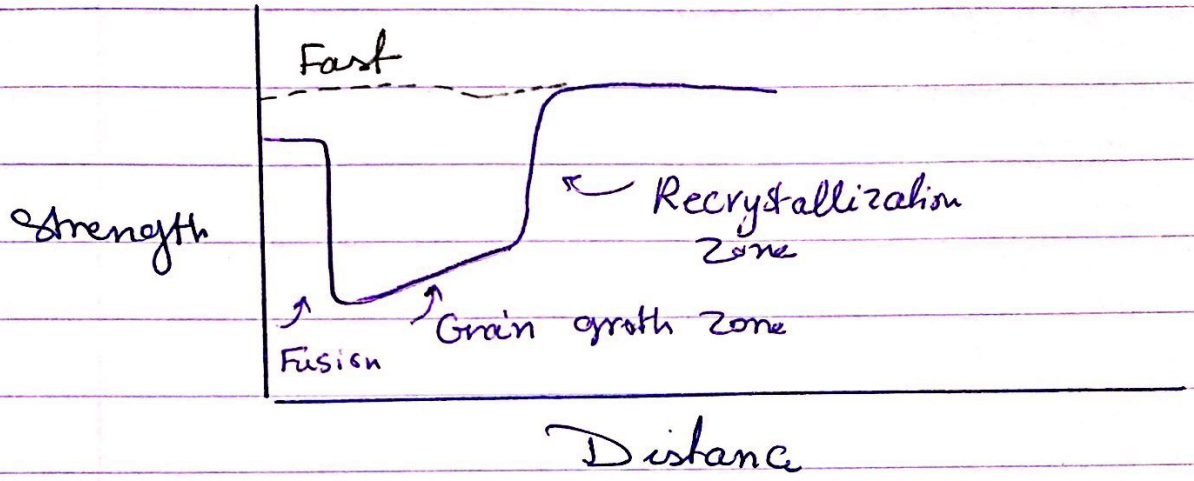
. If the Rolling direction is not right
. a crack will form.



Characteristics of cold Working :-

- we can strengthen the metalic material and produced the desired final shape
- " " obtain dimensional tolerances and surface finishes
- " " produce large number of small parts still cheaply
- Some metals can't handle cold working without breaking (after a certain point)
- Cold working does not affect conductivity when strengthening the conduction

Difference Between Fast and Slow Cool



- The slow cool process causes the loss of strength of the material

- in welding metals are heated to a temp higher than critical temp and so mechanical properties are reduced catastrophically by the heat of the welding process.

→ Characteristics of Hot Working

1- lack of strengthening
2- Elimination of imperfections
3- Anistropic Behavior
4- surface finish and Dimensional Accuracy