

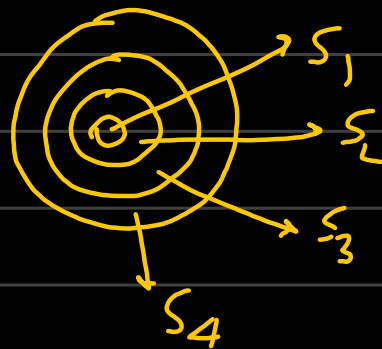
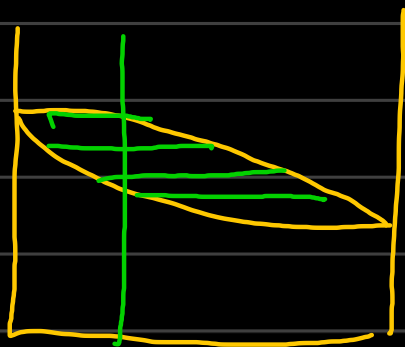
Lecture 3

Materials Processing

Casting:

↳ Microsegregation:

- ↳ contrast due to chemical inhomogeneity
- ↳ gradient in composition.
- ↳ phenomenon referred to as coring.



coring in microstructure.

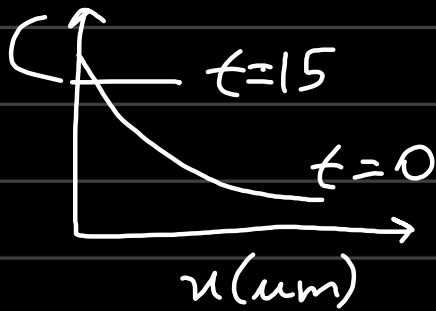
Soln: Heat treatment of microstructure
↳ Homogenization treatment.

Segregation in micro scale: microsegregation
Segregation in macro scale: macrosegregation

Macrosegregation cannot be rectified by heat treatment.

↳ Cast has to be scrapped.

→ Homogenisation: annealing at high temperatures, where the diffusivity is higher.

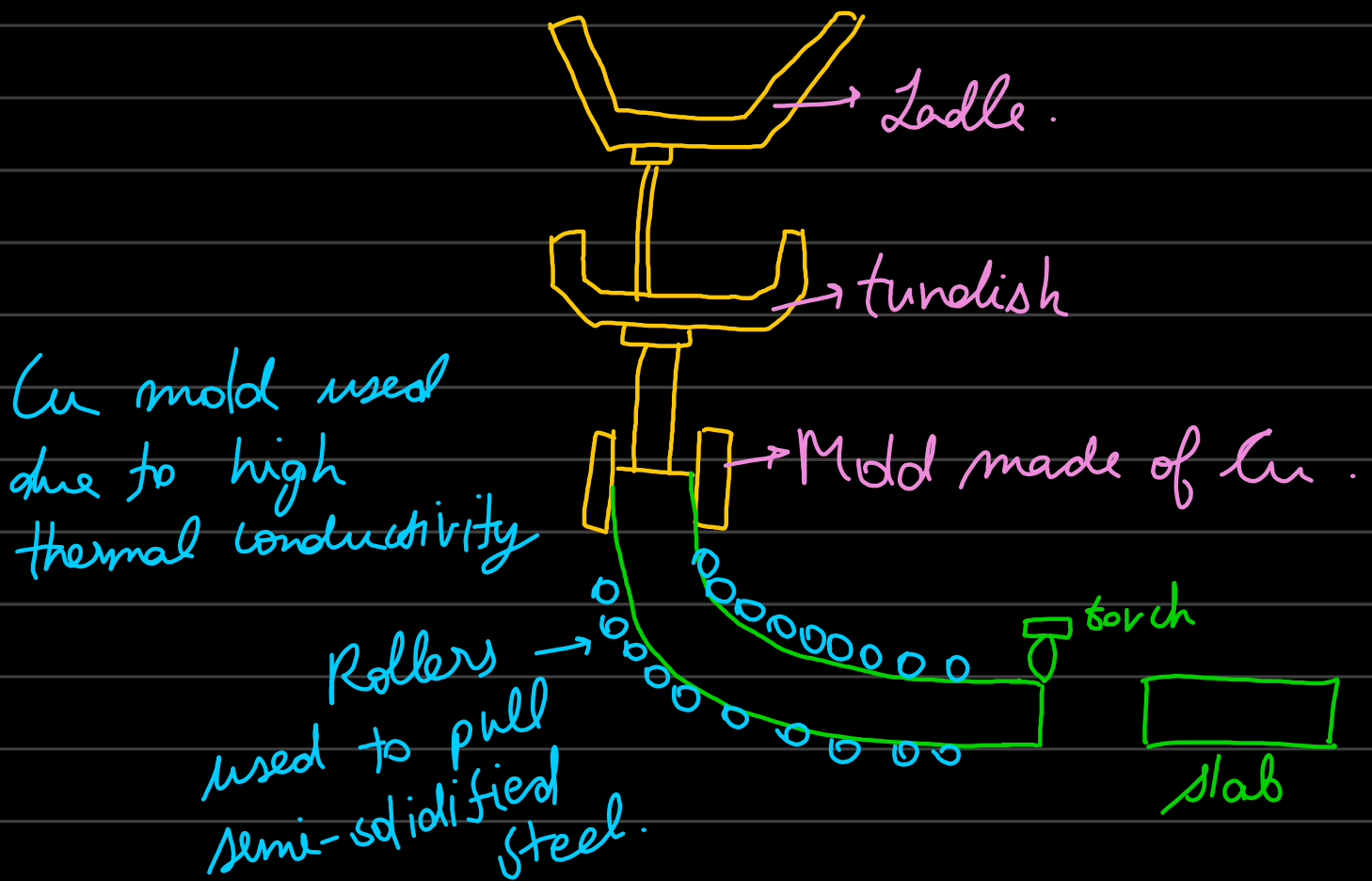


→ To kill compositional gradient, ultrasonic treatment is done.

↳ ultrasound used to break up dendrites as they grow.

→ Most consumed material: Steel. (95%)

Continuous casting.



→ slab of varying length, uniform cross-section

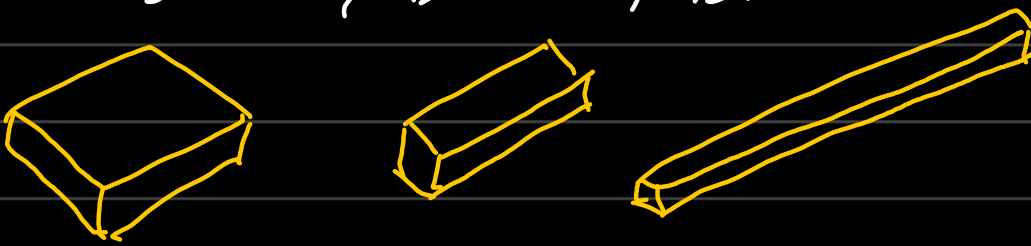
→ Tundish: ensures continuous flow of molten metal (reservoir)

↳ ensures clean supply of metal

↳ reduce segregation

→ Primary 3 shapes can be produced:

↳ Slab, Bloom, Billet



→ Cu molds are oscillating (vibration)
↳ breaks down segregation & ensures homogeneity

→ Inner lining is coated with other high temperature alloys.

→ allowed improvement in yield, quality productivity & cost efficiency.

→ automation break down can have huge implication.

★ Tundish maintains steady metal height.

Electro-magnetic stirring (EMS):

↳ avoid segregation
↳ improve inclusion removal
↳ lowering temperature loss.

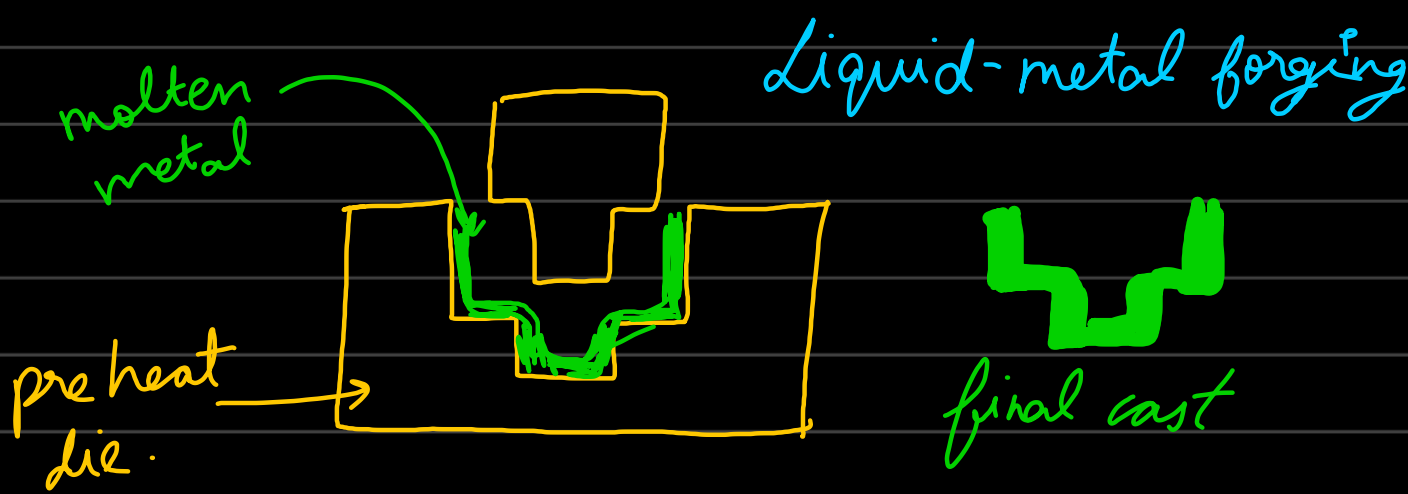
intermetallic particles
(eg: MnS_2)
hard intermetallic.

★ inclusion: unwanted intermetallics.

↳ Mn not allowed to form MnS_2 with Sulphur.

→ MnS kills the steel.

★ gravity cum squeeze casting



direct squeeze casting

→ The mechanical punch operation removes porosity:
→ air gets trapped in solidified microstructure.

* Application of mechanical pressure can help weld these cracks (porosity air cracks)