

Moving Interfaces and Stability

3.044 March 2, 2005

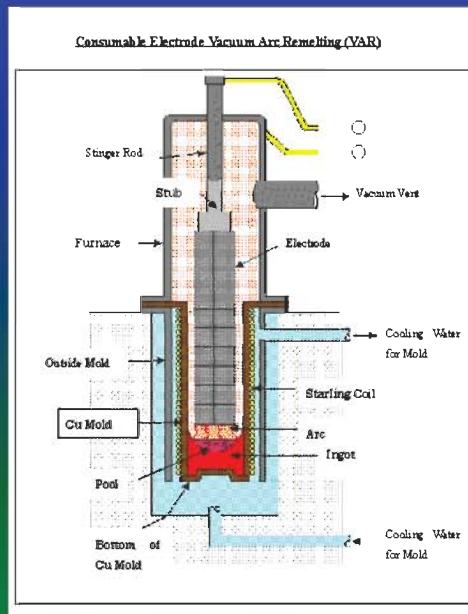
Mechanics:

- Test 1 next Wednesday March 9

Today's lecture:

- Moving Body: "Solid Convection"
- Solidification and Stability

Vacuum Arc Remelting



Courtesy of Toho Titanium, Ltd. Used with permission.

Last time:

- Conduction-limited solidification of pure material
- Heat transfer in the electrode

Solidification and Stability

- Is the VAR melt front stable? Why?
- Is the solidifying shell stable?
- Is a solid particle growing into an undercooled liquid stable?
- Summary:
 - Limited by heat/mass transfer coeff, interface reaction -> Stable
 - Limited by conduction through the solid -> Stable

 - Limited by conduction or diffusion in liquid -> Unstable

Limited by diffusive process "in front of" the interface -> Unstable.

Limited by diffusive process "behind" the interface -> Stable.