HAPPY BIRTHDAY DAVID!

(How old are you..)

Complex Structure Formation

3.044 March 4, 2005

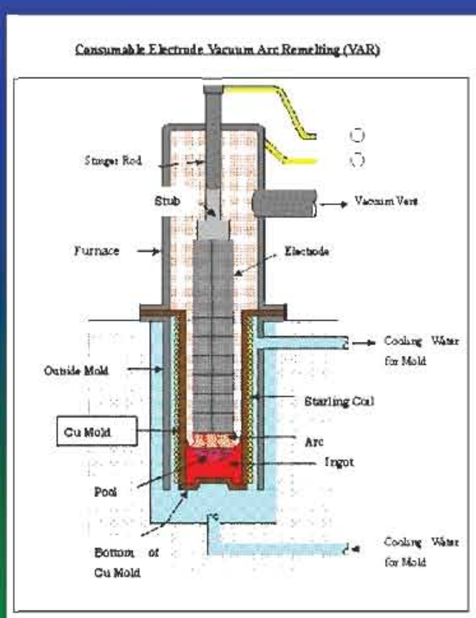
Mechanics:
- Problem set 3 returned today
- ACP office hour today
- Test 1 next Wednesday March 9

Today's lecture:
- Test questions
- Alloy solidification, complex structure formation

Test 1 Wednesday 3/9

- Study: memorize equations on the list, do practice problems in the assignments section
- Take the test, will include equation sheet
- If you need an equation not on memorization list, not on equation sheet, raise your hand and I'll put it on the board
- Indicate on answer book which recitation you'll attend
- Between Wednesday and Thurs/Fri: study exam, preferably with others!
- Re-do erroneous parts during recitation

Muddy From 3/2: Arc Issues



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"I thought arcs were the the other way: small gap, small heat..."

It depends:

- Constant voltage: small gap -> large current, large heat
- Constant current: small gap -> small volume, small heat

Stability: constant voltage
Industry: constant current, active gap control

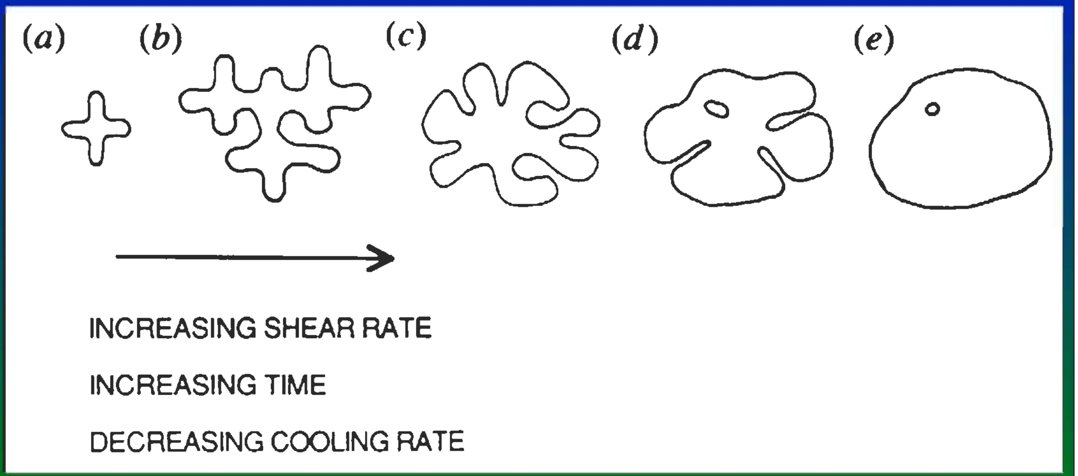
Alloy Solidification

- Eutectic solidification rejects solute, e.g. Al-Cu, Si-B, water-collagen
- Precipitation "rejects" solvent, e.g. Mg(OH)2 from water
- Electrolysis/plating: like precipitation, also electric field concentrates at perturbations

All of these are limited by reaction or diffusion ahead of the front; are they stable? Maybe...

Shear and Stability

Solidifying particle in an undercooled liquid



Source: Flemings, M. C. "Behavior of metal alloys in the semisolid state." *Metall Trans* 22B, no. 3 (1991): 269-293.