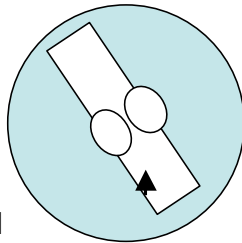


Welding Micrographs

Spring 2007

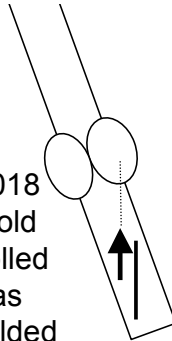
Do NOT handle the specimens.
Use knobs under the stage to position.
Start with 5X or 10X objective. Focus, then go to 20X or 50X. (Return to 10X before going to next specimen.)
Locate the arrow on each for start point.

1045
Hot
Rolled



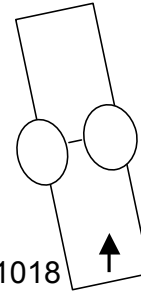
- Recall phase diagram.
- 0.45% C - Obvious pearlite ($\alpha + \text{Fe}_3\text{C}$)
- Martensite not likely (recall 1045 TTT)
- Base - Similar to normalized - relatively large equiaxed grains, coarse pearlite.
- HAZ - Heated into austenite, then cooled rapidly compared to hot rolled base.
- Therefore - smaller grains, finer pearlite.
- Fusion (weld metal) - dendrites.
- Note "mixture" zone-base grains with weld metal. Also, grain boundary material melted and fused.

1018
Cold
Rolled
as
Welded



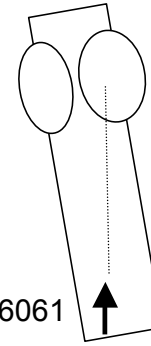
- Note rolling texture. (Rolling direction is parallel to weld - i.e., toward you.)
- Follow the line of Vickers hardness indentations. Note the picture posted on board.
- HAZ - Nucleation and grain growth of cold-rolled material.
- Lower C content than 1045. Less pearlite.
- Fusion (weld metal) - dendrites.
- Note "mixture" zone-base grains with weld metal. Also, grain boundary material melted and fused.

1018
Cold Rolled
Welded
then
Annealed



- Same material - cold-rolled 1018, then welded.
- Greater thickness. But not a factor for comparison.
- Nucleation and grain growth throughout the entire specimen.
- Equiaxed in base metal.
- Original fusion dendrite direction evident, but more homogeneous.

6061



- Difficult material to etch for grain structure.
- Follow the line of Vickers hardness indentations. Note the picture posted on board.
- HAZ - Note change of color.
- Aluminum heat conduction higher, so the HAZ is not as wide as for steel.
- NOTE: spacing of indents is 1mm compared to 0.25mm for steel.
- Fusion (weld metal) - dendrites.
- Note "mixture" zone-base grains with weld metal.
- Measurement of indent size.
 - Check 20X objective and "9020" displayed at top right screen.
 - Adjust X & Y cursors.
 - Turn down intensity of lamp to read.