

SIMSMC JUNE 2003

Module: THE POWER OF METAL IN THE ANDEAN WORLD/ Laboratory

METALLIC MICROSTRUCTURES: Worked metal

The samples for examination are all examples of metals that have been worked, and their microstructures reveal the circumstances of such work: cold work, cold work followed by annealing, hot work, etc. Observe and describe the microstructure of each.

SPECIMEN TM-32: Tough pitch copper (0.04 % oxygen), hot extruded;
longitudinal section

What is the evidence that this material was hot extruded? What are the non-metallic inclusions in the sample? How do you account for their orientation? Describe the grains and overall grain structure.

SPECIMEN TM-33: Brass (80 % Cu, 20 % Zn), hot extruded then cold drawn

Is the grain structure uniform throughout this specimen? How is the structure at the center of the sample different from that along the two short sides? How do you account for the difference? Describe the grain structure and discuss why the grains appear as they do.

SPECIMEN TM-34: Brass (80 % Cu, 20 % Zn), hot extruded and cold drawn,
then annealed

Describe the grains and the overall microstructure of this specimen. How does the structure differ from that of sample TM-33? What accounts for the difference in the two microstructures?

SPECIMEN 231: Copper-silver alloy (60.4 % Cu, 39.6 % Ag), as cast

SPECIMEN 256: Copper-silver alloy (60.4 % Cu, 39.6 % Ag), cast, then cold worked
and annealed to reduce its thickness by 55%

Examine 231 and 256 as a pair. How do the microstructures differ between the cast sample and the worked-and-reduced sample?

SPECIMEN M-223: Bronze (90% Cu, 10 % Sn), hot forged @ 625° C to achieve an
87 % reduction in thickness

Is the microstructure uniform throughout the sample? If not, describe the different microstructural zones. Characterize the grains in each zone. What accounts for the differences among them?