

NOSE RING (MIT 4000)

COMPOSITION: Copper-gold alloy [*tumbaga*] containing 6.22% gold and 0.29% silver, by weight

MICROSTRUCTURE

SECTION A: Longitudinal section through an end cap and a short length of the shaft

Photomicrographs

A1 - The polished section exhibits several microstructural features characteristic of a casting. There is a shrinkage cavity, in the form of several large, discrete porosities, located along the mid-line of the sample in the region of the end cap. The shrinkage occurred during solidification of the molten alloy. Elsewhere, especially in the region of the shaft, the pores are round and much smaller in size. They are randomly distributed throughout the section and show no preferred orientation.

The metal is heavily corroded in both the end cap and the shaft. The corrosion has formed preferentially in the segregated (cored) regions of the alloy whose composition is higher in copper, lower in gold. The corrosion follows the dendritic microstructure of the cast metal, and the dendrites appear to be in their original, as-cast configuration. They show no signs of having been deformed plastically through working subsequent to casting.

The end cap and shaft were cast integrally. There is no microstructural discontinuity at the juncture of end cap and shaft [x17; as-polished].

A2 - Detail of the thin, protuberant rim of the end cap shown in A1. This magnification reveals the intergranular corrosion that has formed at some of the grain boundaries, outlining the grains even before the metal is etched. The massive dendritic corrosion has almost completely mineralized some of the grains [x30; as-polished].

A3 - The same detail shown in A2, after etching. The dendritic coring is pronounced [x30; Etchant: FeCl_3].

A4 -This photomicrograph was taken at the cut surface of the shaft in a region almost free of corrosion. The etchant has developed both the dendritic segregation and the grain boundaries. The fine-line, corrosion free boundaries outline equiaxed grains. There is no evidence of the metal having been worked (plastically deformed) subsequent to casting [x100; Etchant: FeCl₃].

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INTERPRETATION OF MICROSTRUCTURE

This nose ring is a single piece, solid casting made from a low-gold *tumbaga* alloy. It may have been cast by the lost wax method. Beneath the external layer of corrosion product an extremely thin and discontinuous gold layer adheres to the surface of the object.