Appendix 3: Colour photomicrographs of bronzes cast in clay moulds

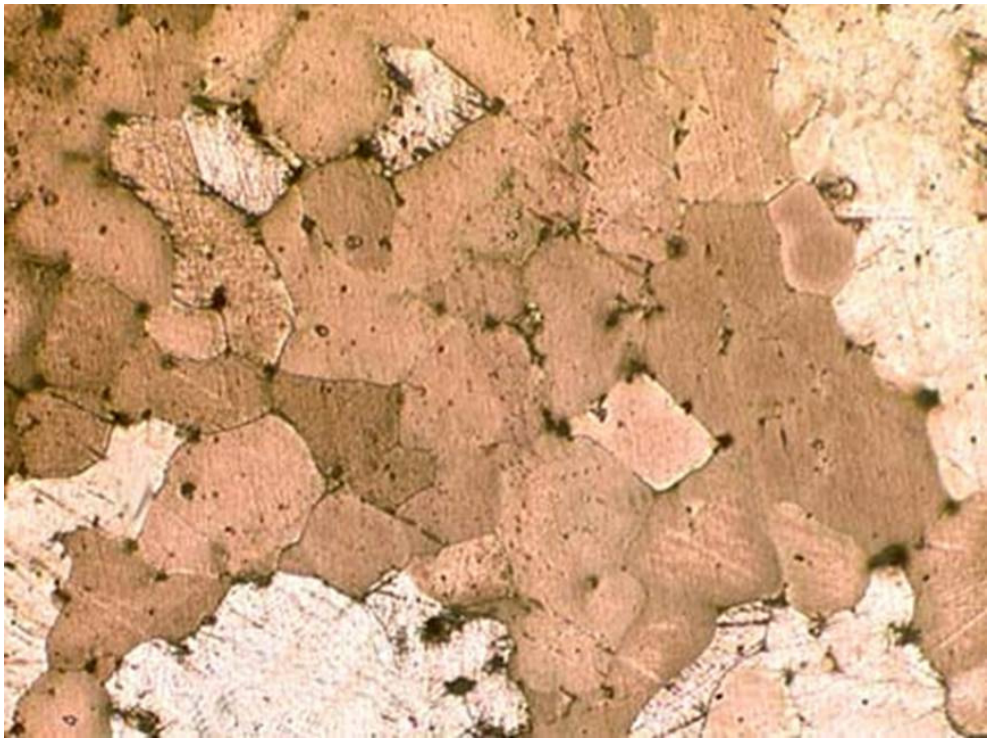


Figure C1. 2% Sn bronze, preheated/air-cooled, showing a granular structure without α+δ eutectoids. Image width 1.3mm

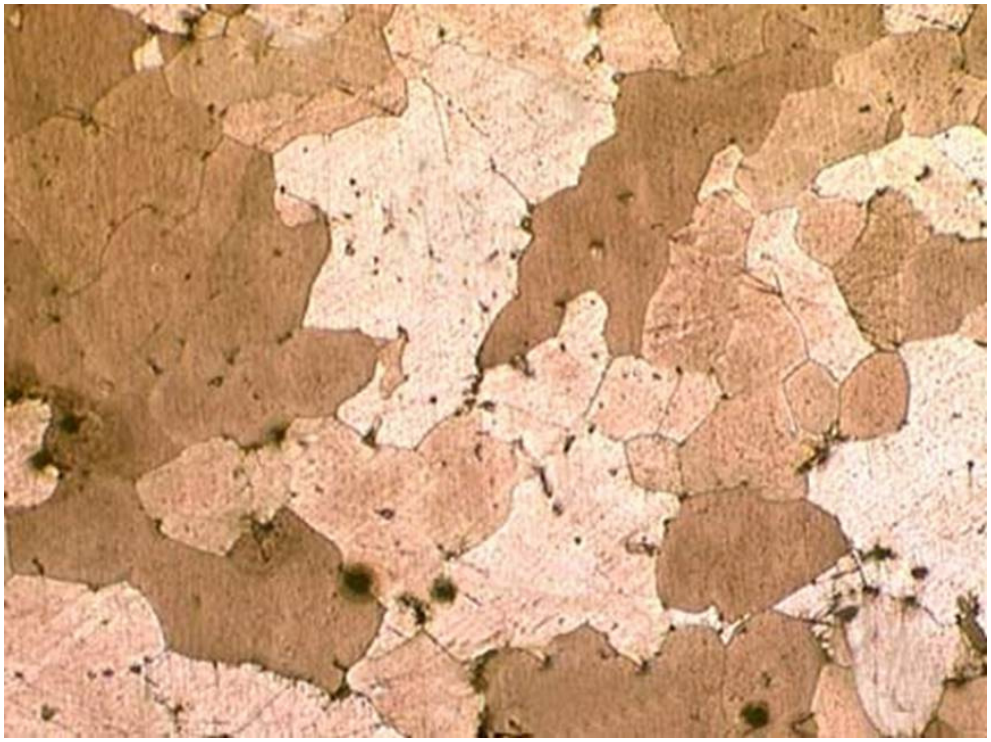
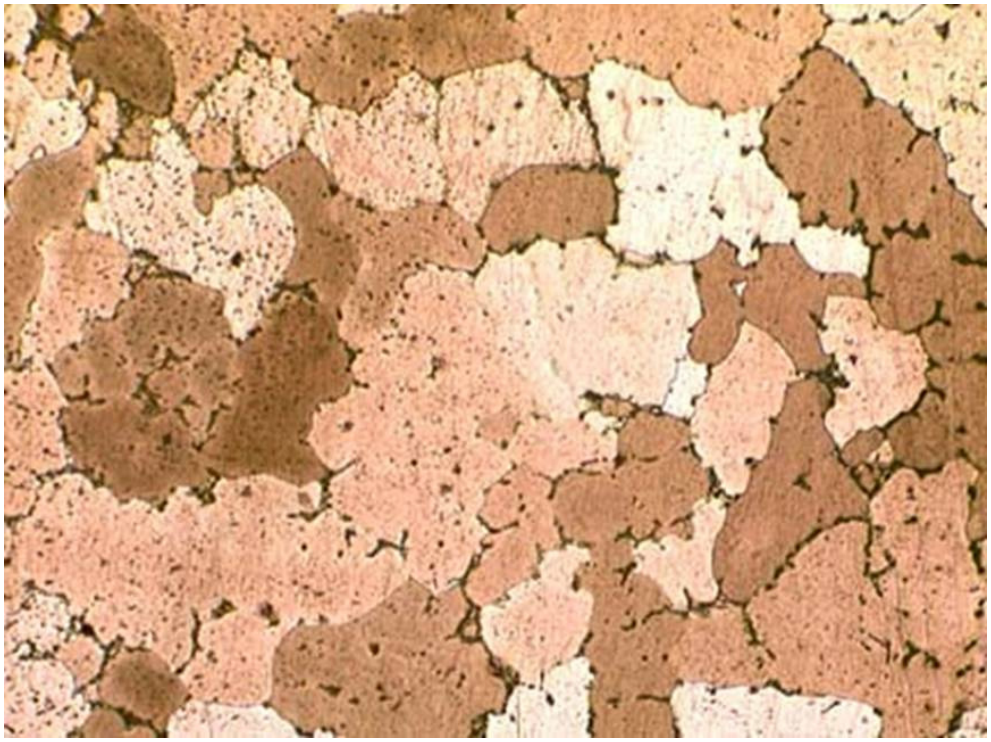


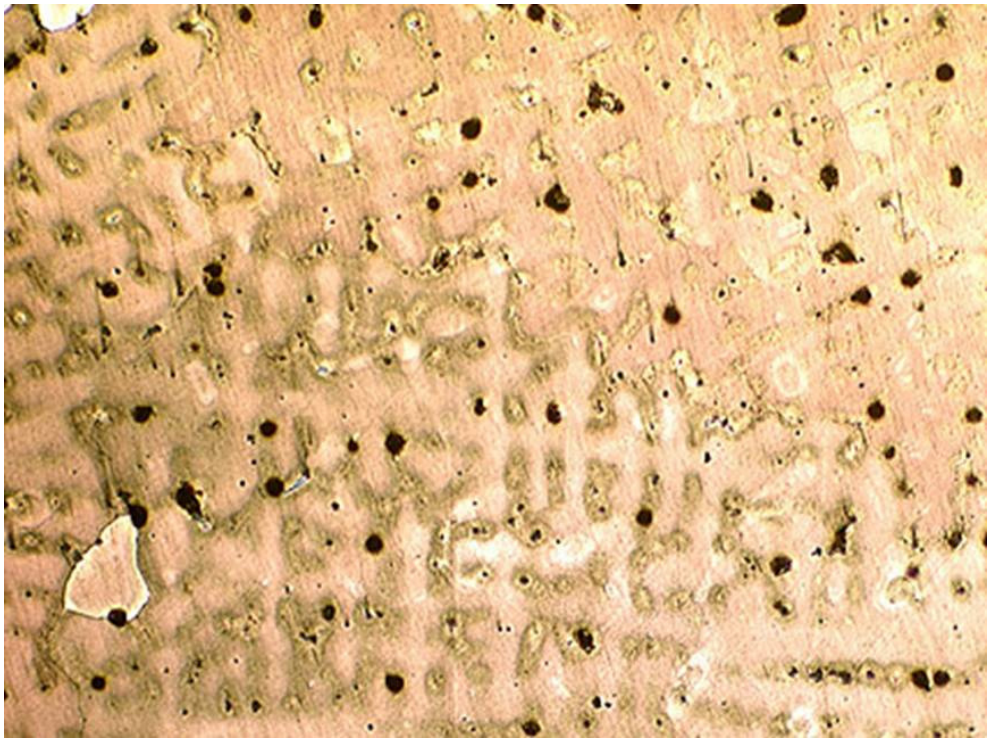
Figure C2. 2% Sn bronze, unpreheated/air-cooled, showing a granular structure without α+δ eutectoids. Image width 1.3mm



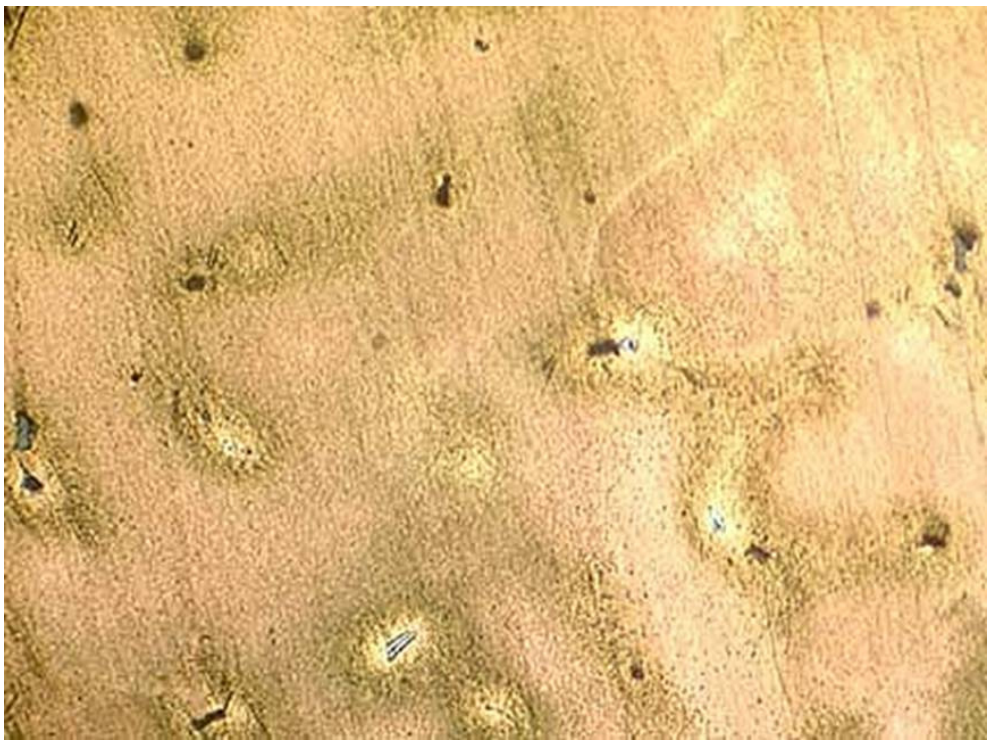
a: Image width 1.3mm

b: Image width 0.33mm

Figure C3. 2% Sn bronze unpreheated/water-quenched, showing a granular structure with α+δ eutectoids on grain boundaries.

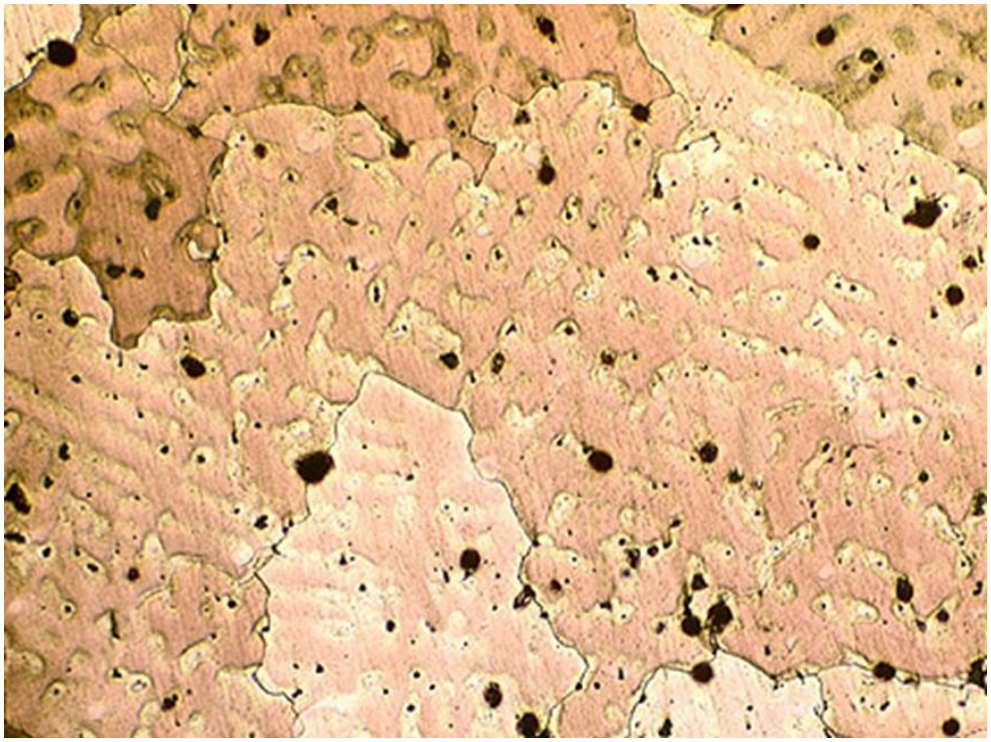


a: Image width 1.3mm

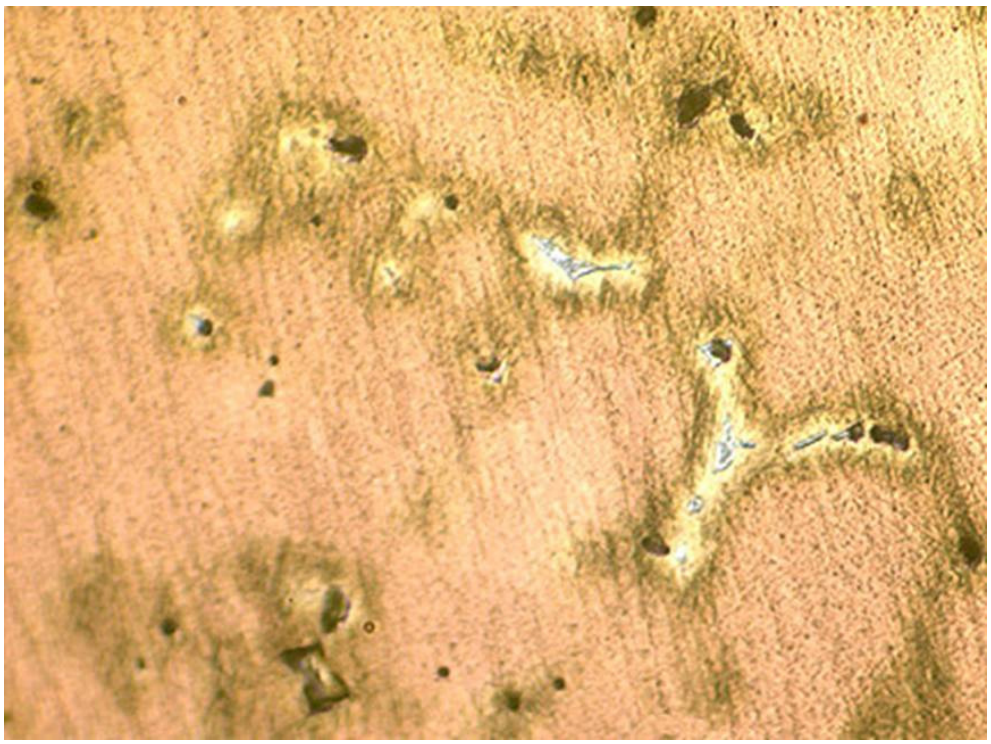


b: Image width 0.33mm

Figure C4. 6% Sn bronze, preheated/air-cooled, showing a dendritic structure with few α+δ eutectoids.

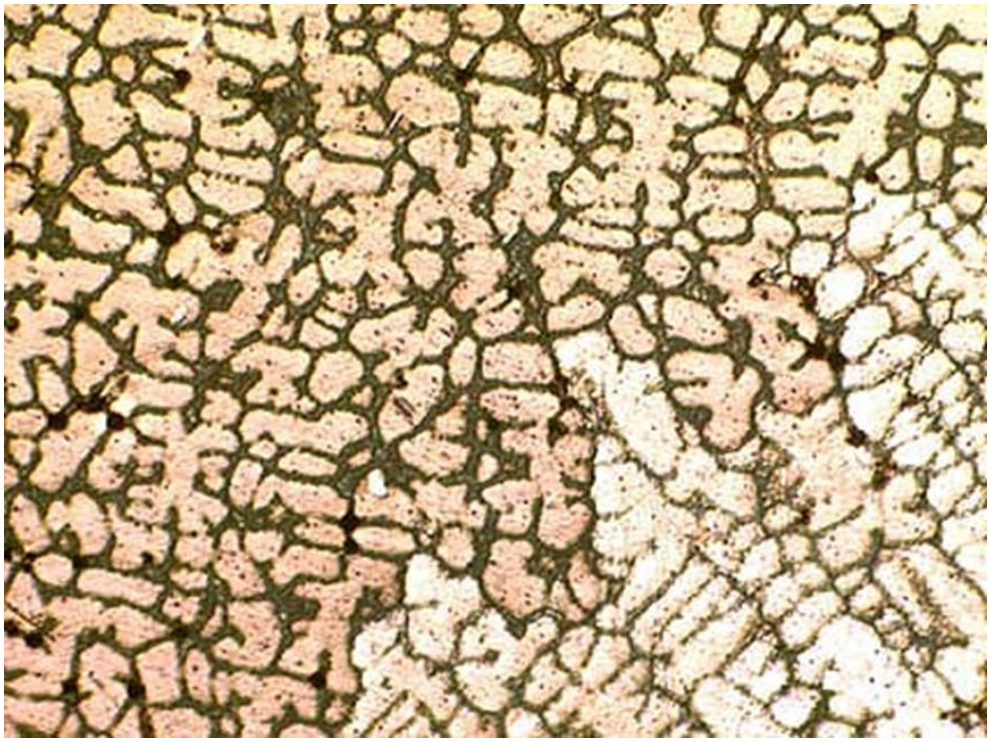


a: Image width 1.3mm

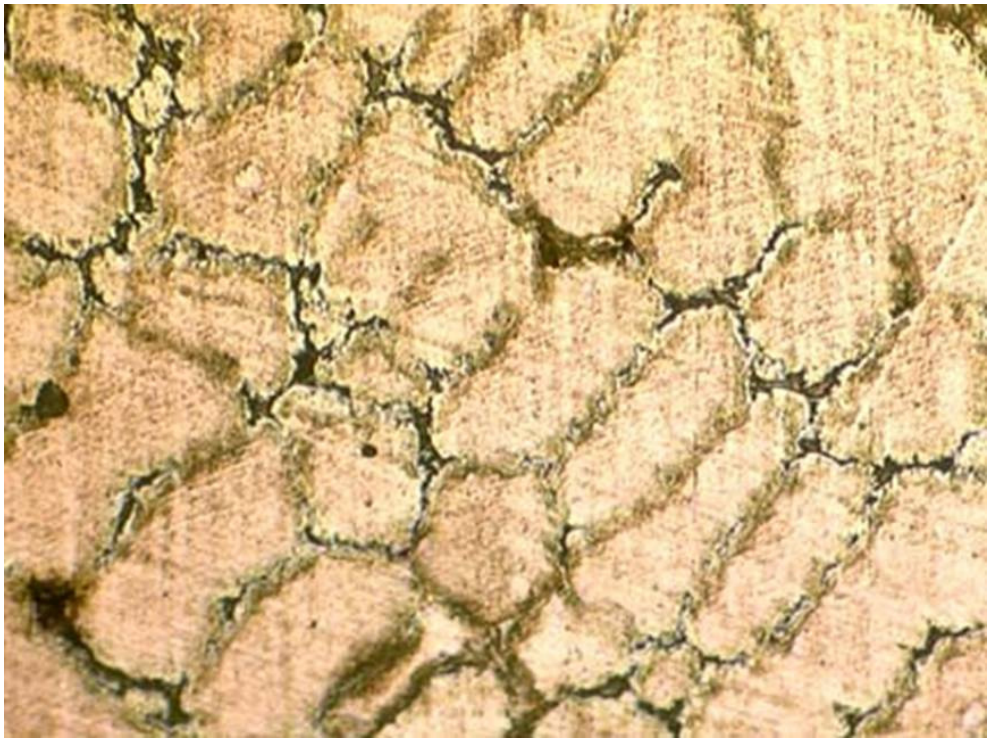


b: Image width 0.33mm

Figure C5. 6% Sn bronze, unpreheated/air-cooled, showing a similar structure to the preheated/air-cooled bronze (fig. C4)

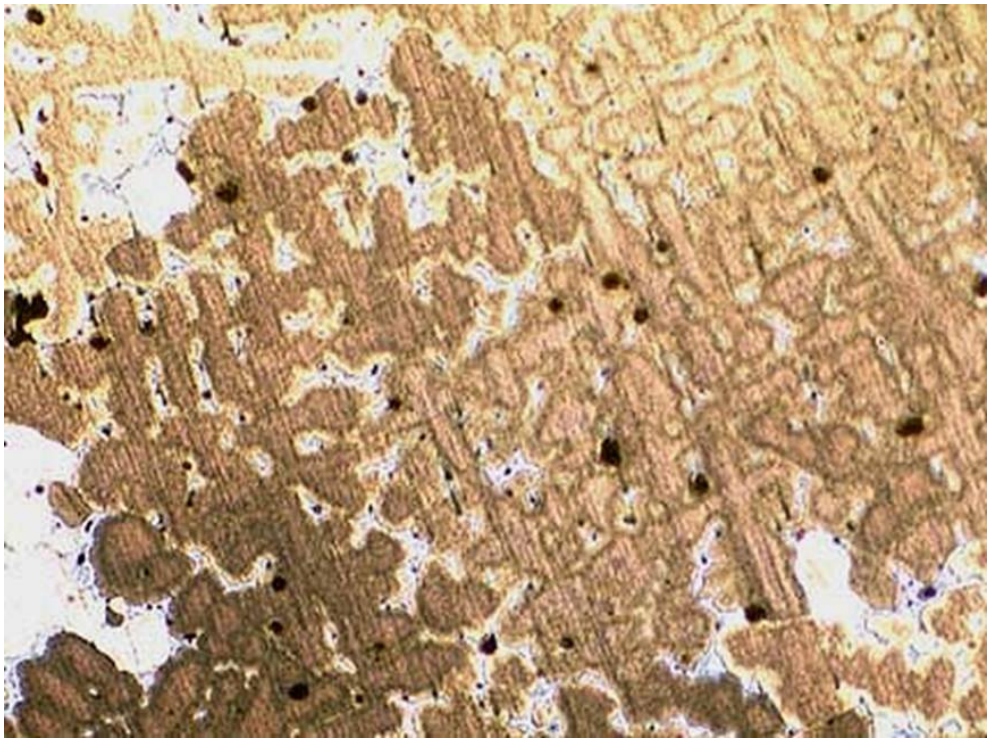


a: Image width 1.3mm

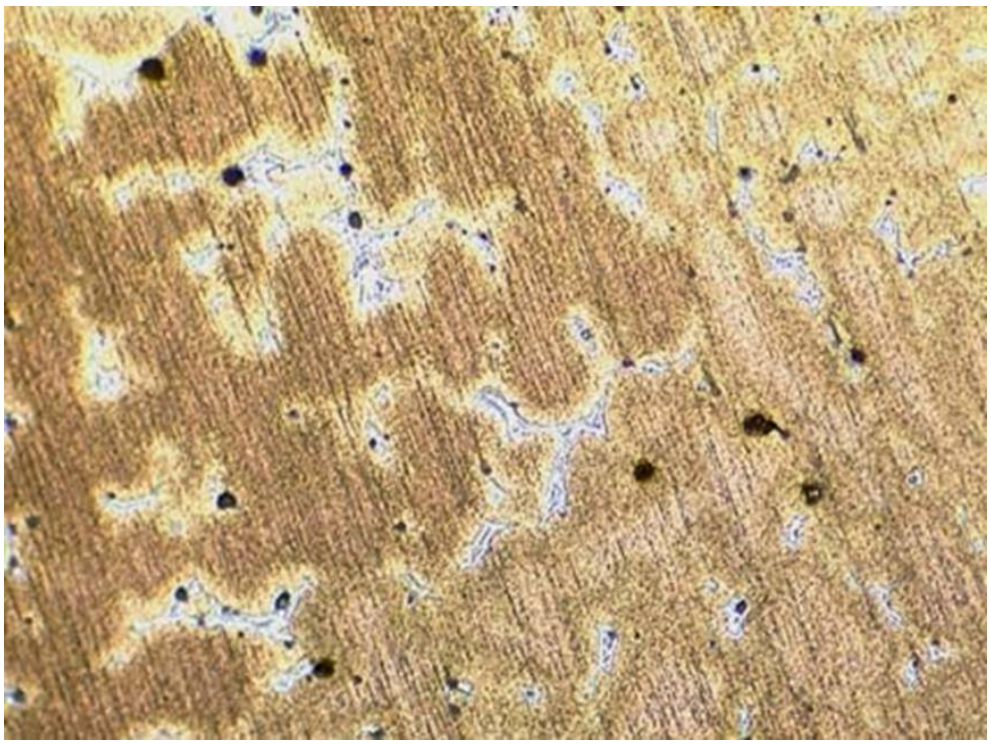


b: Image width 0.33mm

Figure C6. 6% Sn bronze, unpreheated/water-quenched, showing a pronounced structure with abnormal α+δ eutectoids in the interdendritic regions.

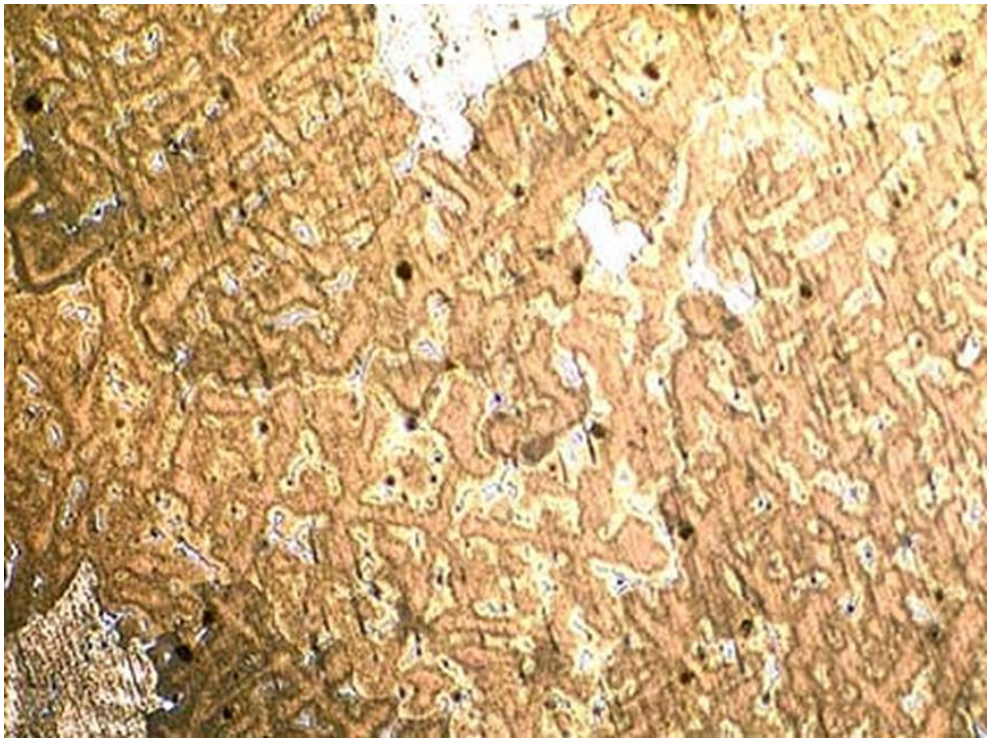


a: Image width 1.3mm

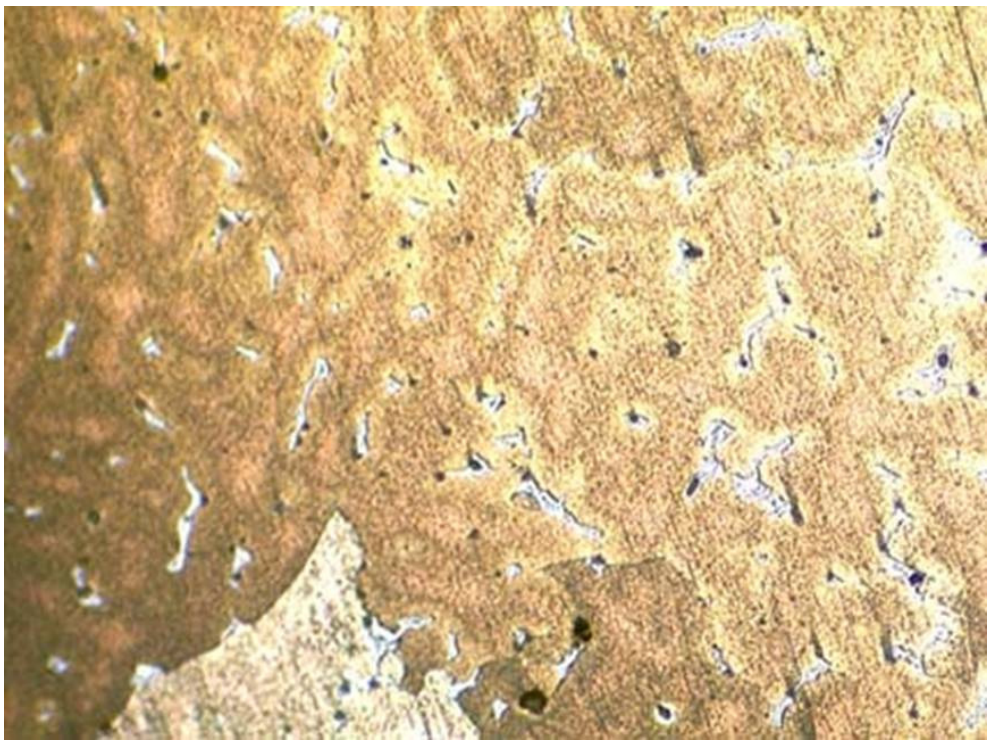


b: Image width 0.65mm

Figure C7. 10% Sn bronze, preheated/air-cooled, showing a dendritic structure with α+δ eutectoids in the dendritic regions.

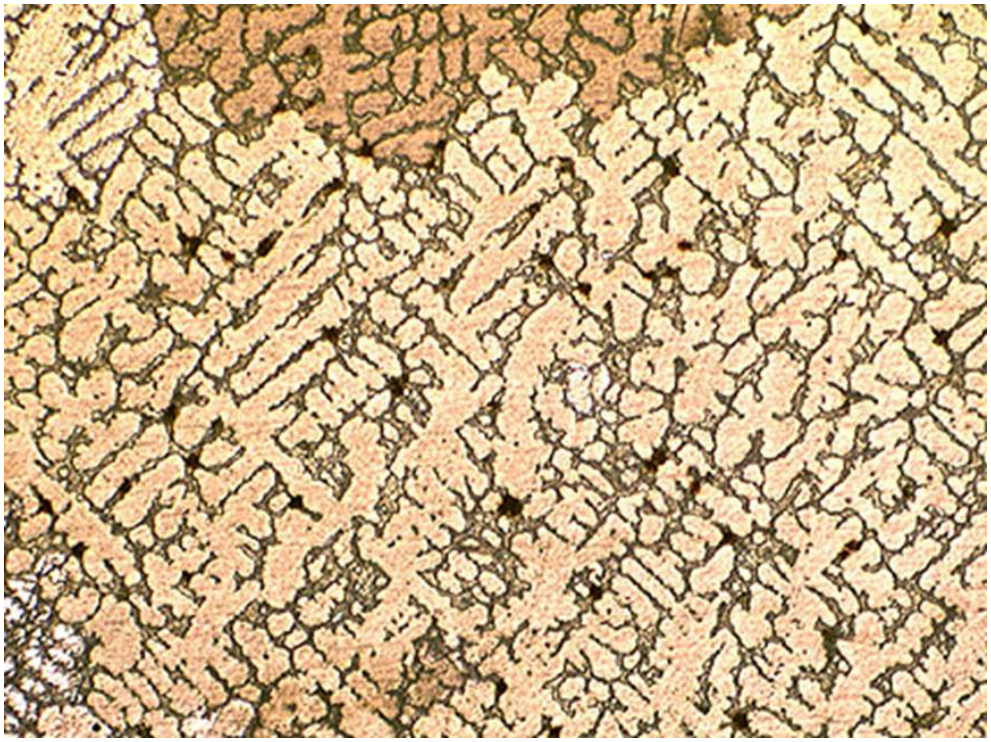


a: Image width 1.3mm

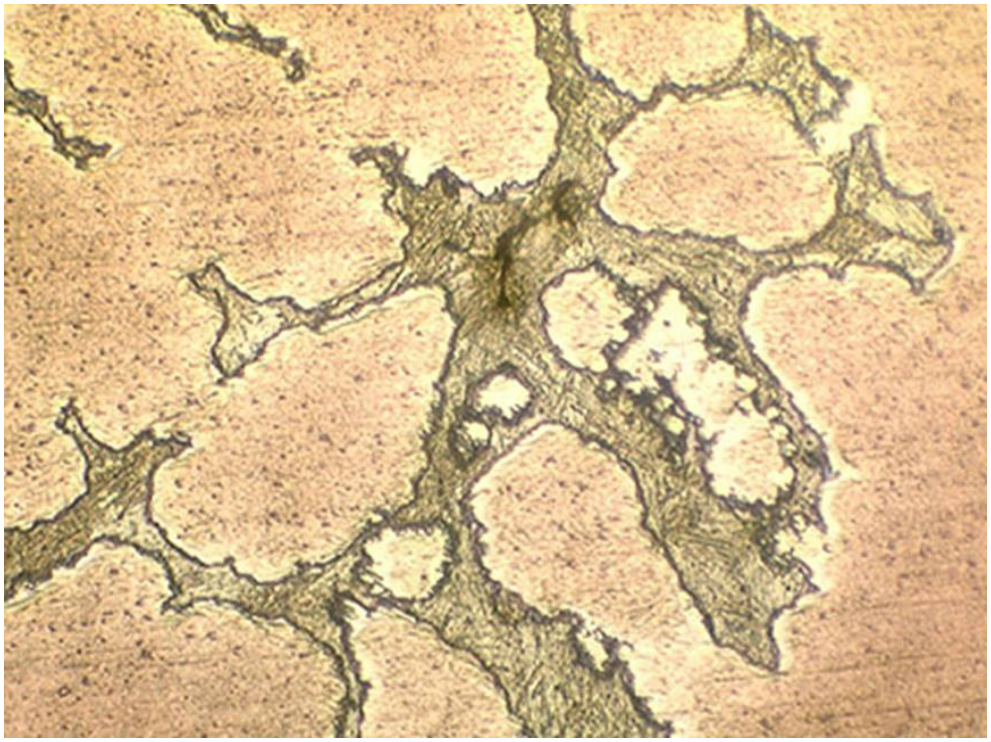


b: Image width 0.65mm

Figure C8. 10% Sn bronze, unpreheated/air-cooled, showing a similar structure to the preheated/air-cooled bronze (fig. C7).

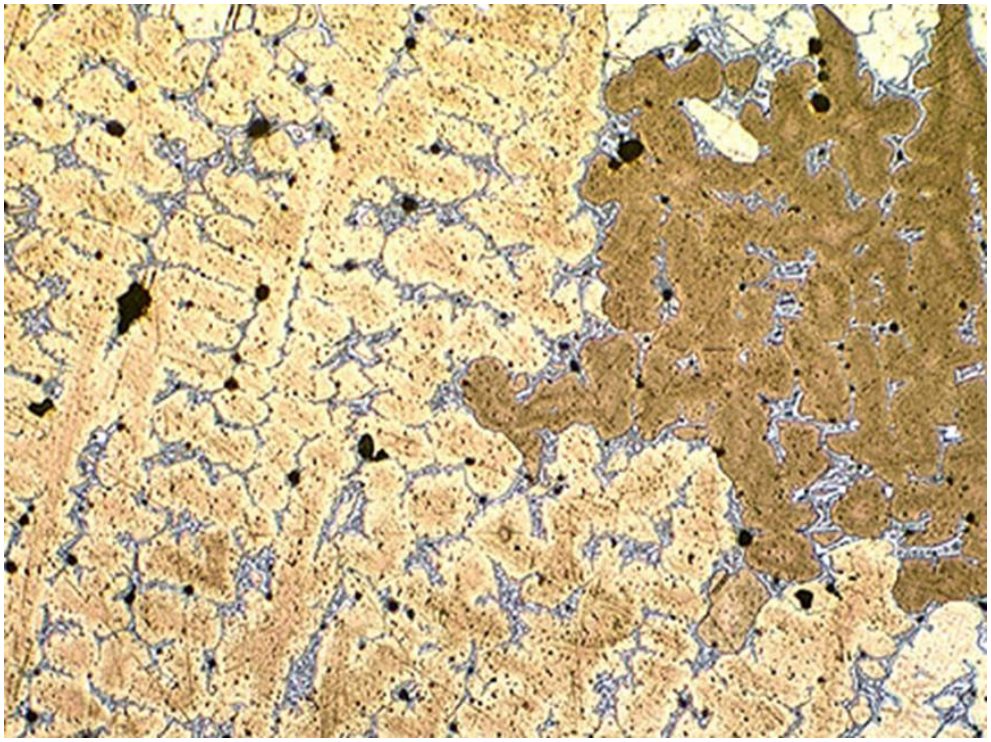


a: Image width 1.3mm

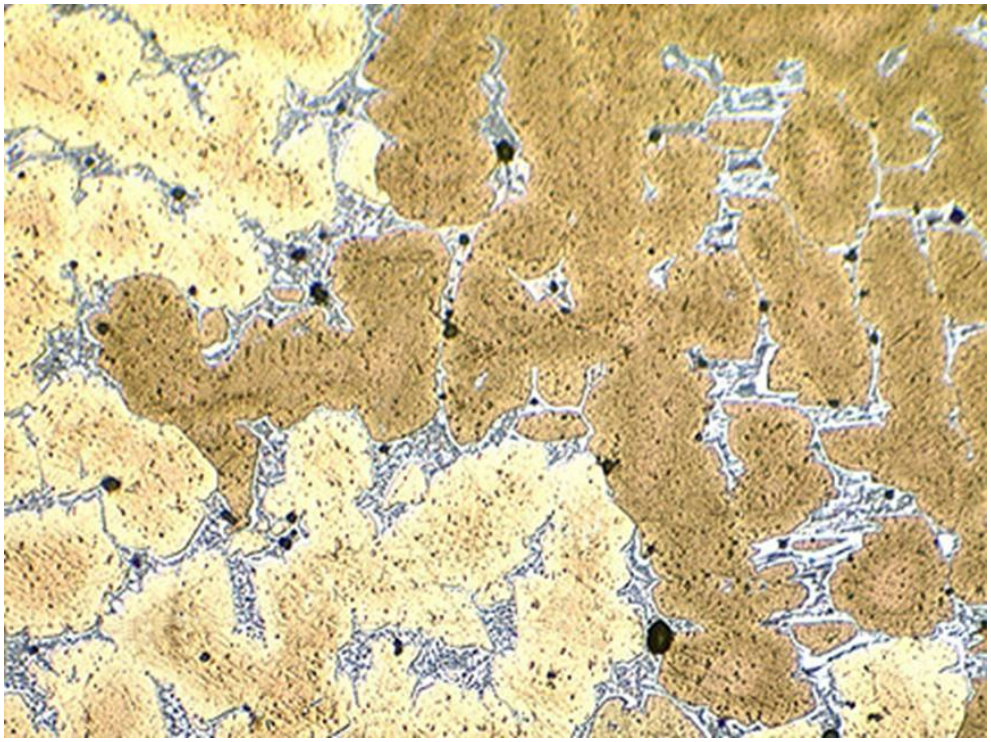


b: Image width 0.13mm

Figure C9. 10% Sn bronze, unpreheated/water-quenched, showing a pronounced dendritic structure with needle β phase in the interdendritic regions and abnormal δ phase on the boundaries.

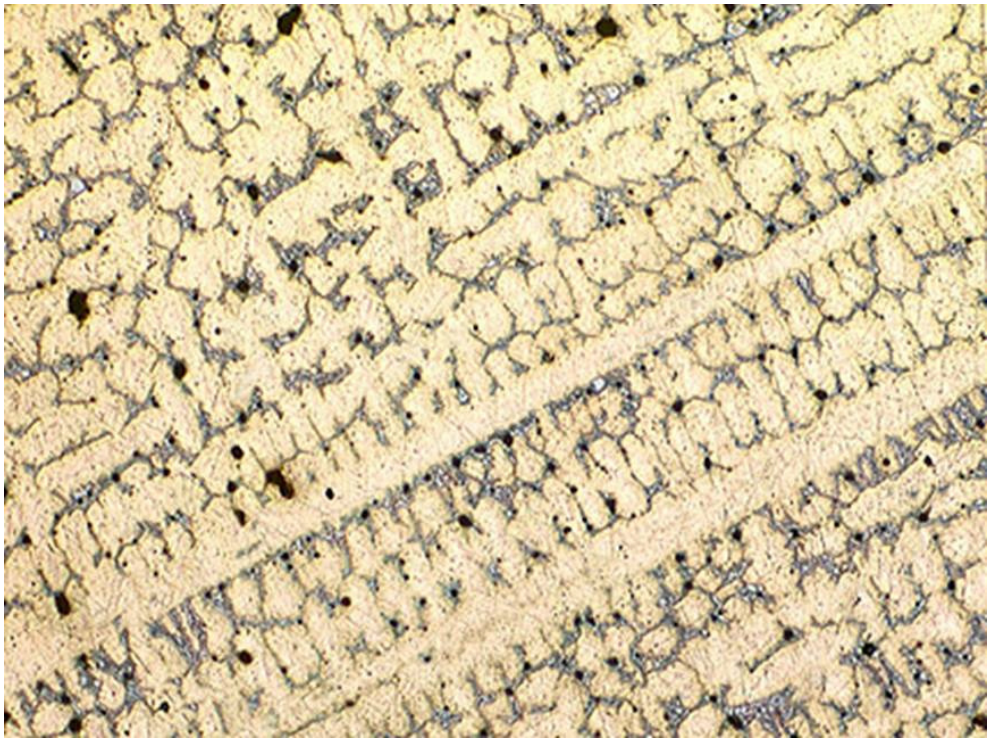


a: Image width 1.3mm

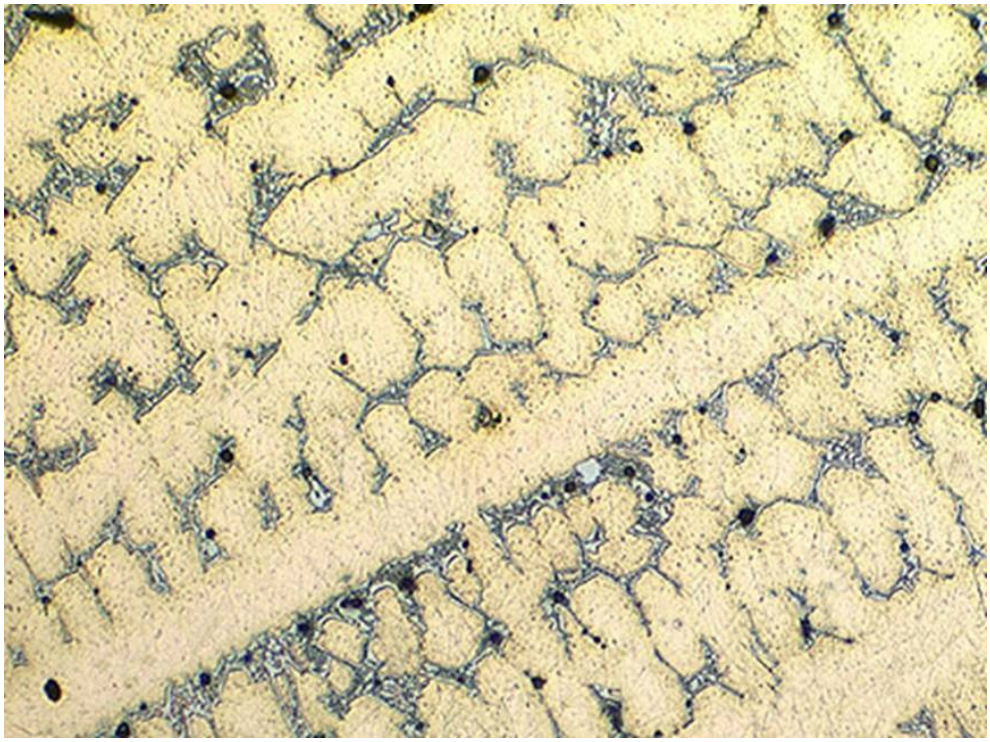


b: Image width 0.65mm

Figure C10. 15% Sn bronze, preheated/air-cooled, showing a dendritic structure with many α+δ eutectoids.

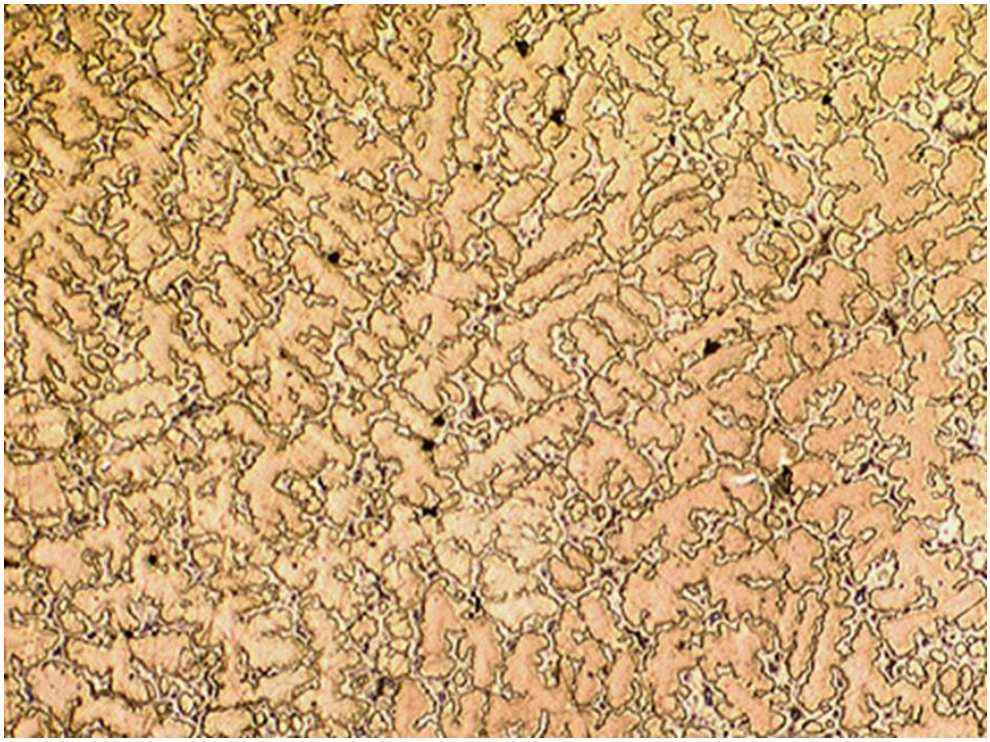


a: Image width 1.3mm



b: Image width 0.65mm

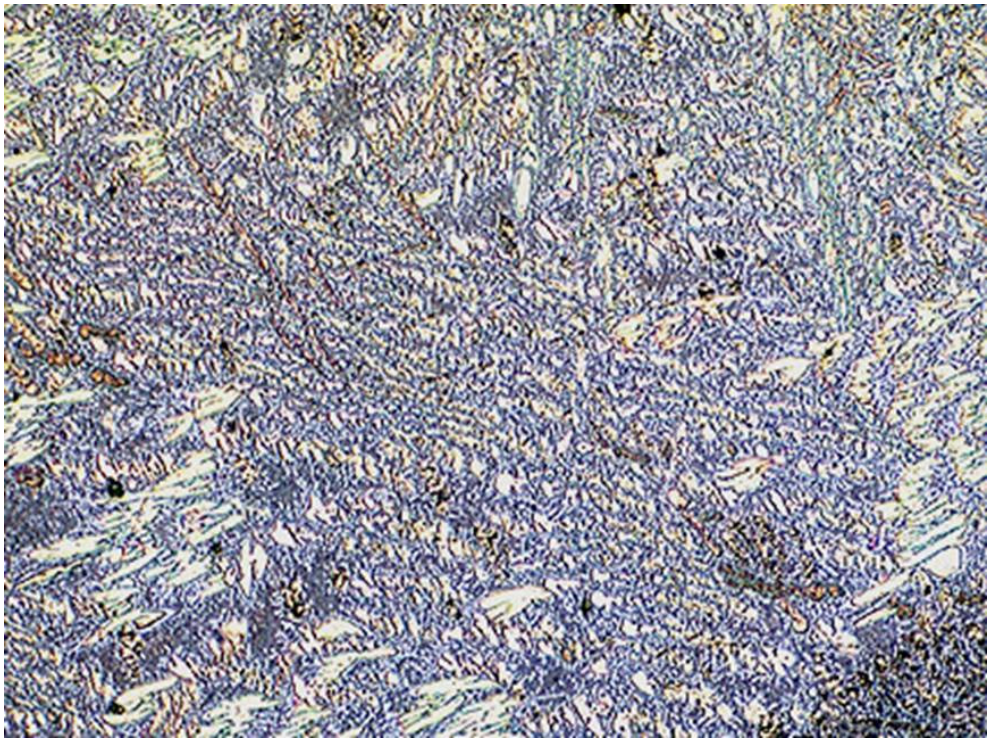
Figure C11. 15% Sn bronze, unpreheated/air-cooled, showing a dendritic structure with longer dendrites and smaller dendritic arm spacing than the preheated/air-cooled bronze (fig. C10).



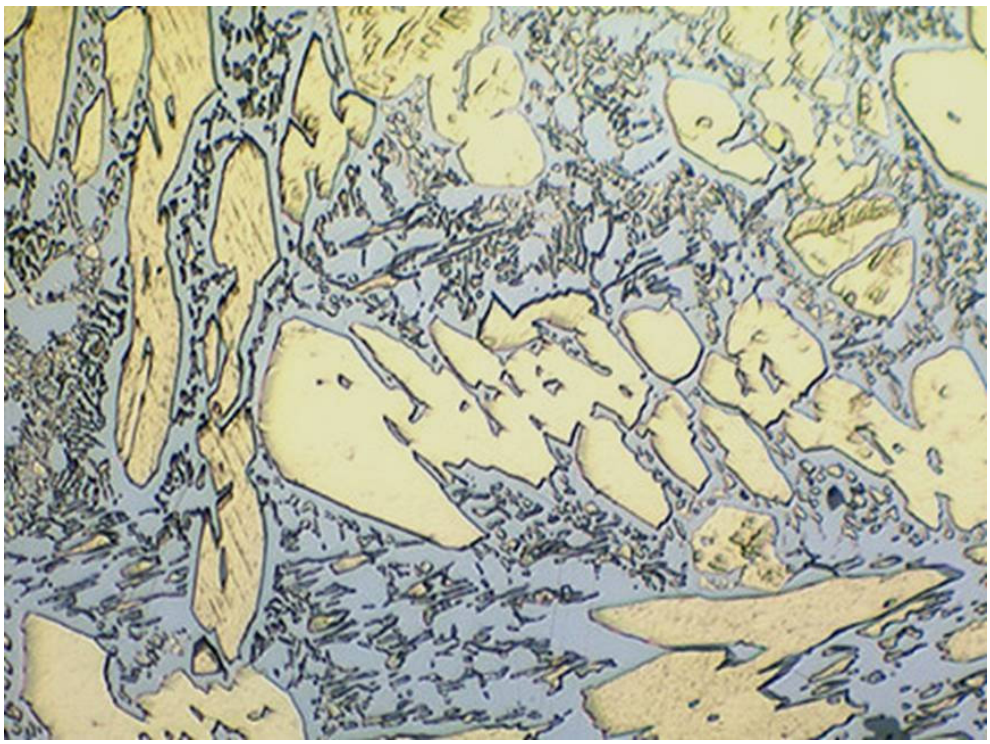
a: Image width 1.3mm

b: Image width 0.13mm

Figure C12. 15% Sn bronze, unpreheated/water-quenched, showing a dendritic structure with needle β phase in the interdendritic region.

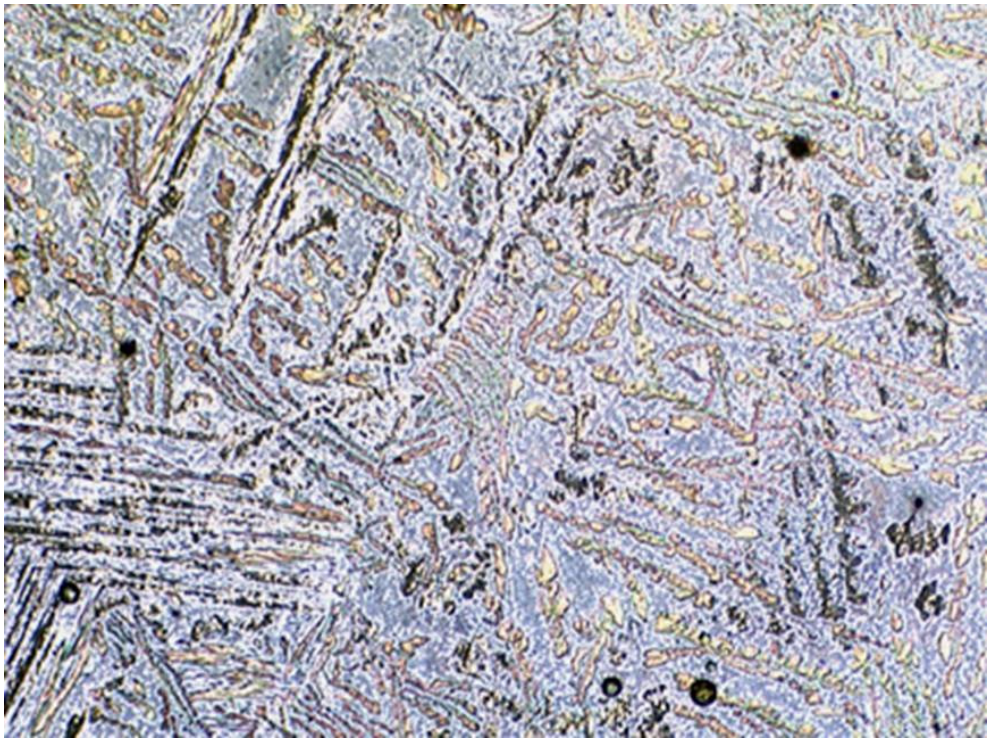


a: Image width 1.3mm

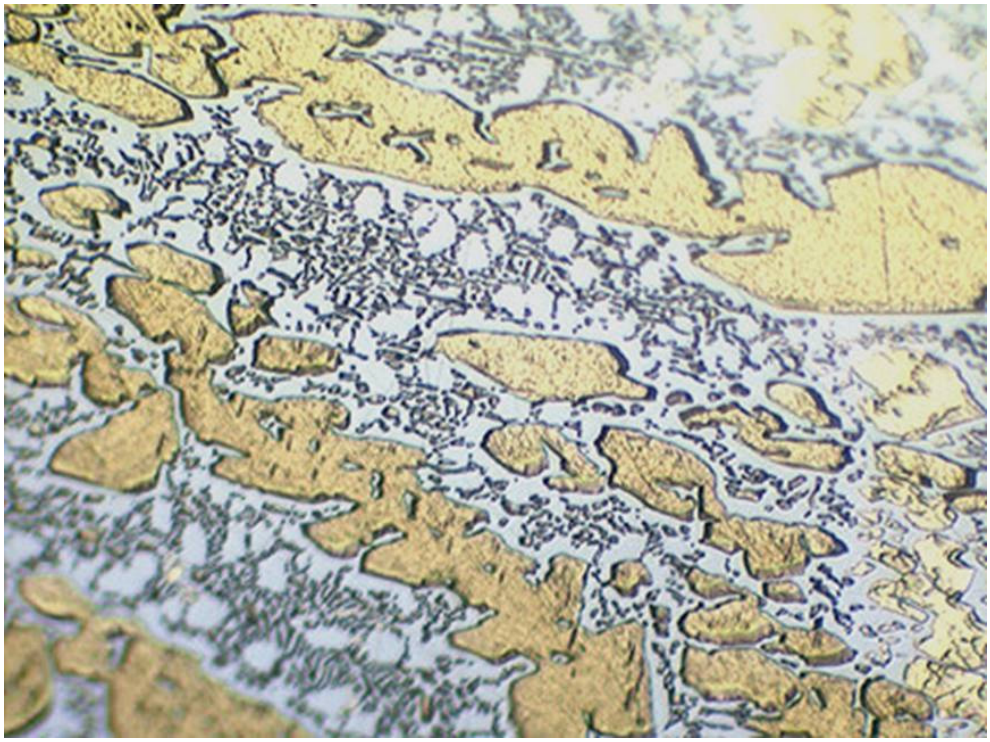


b: Image width 0.13mm

Figure C13. 23% Sn bronze, preheated/air-cooled, showing presence of massive α+δ eutectoids.

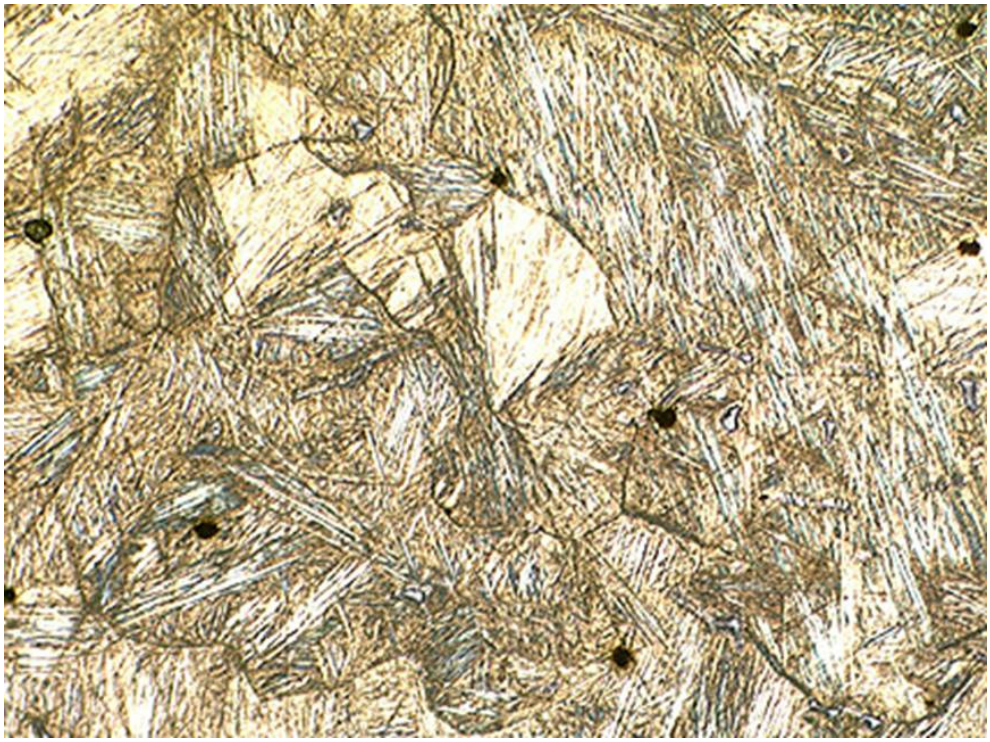


a: Image width 1.3mm

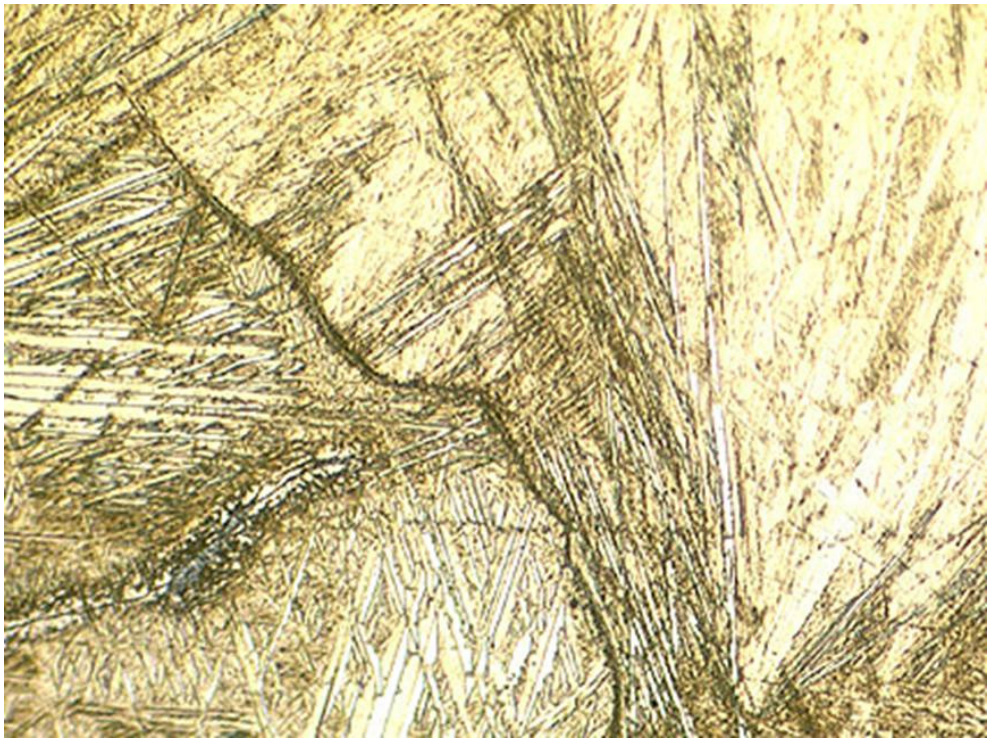


b: Image width 0.13mm

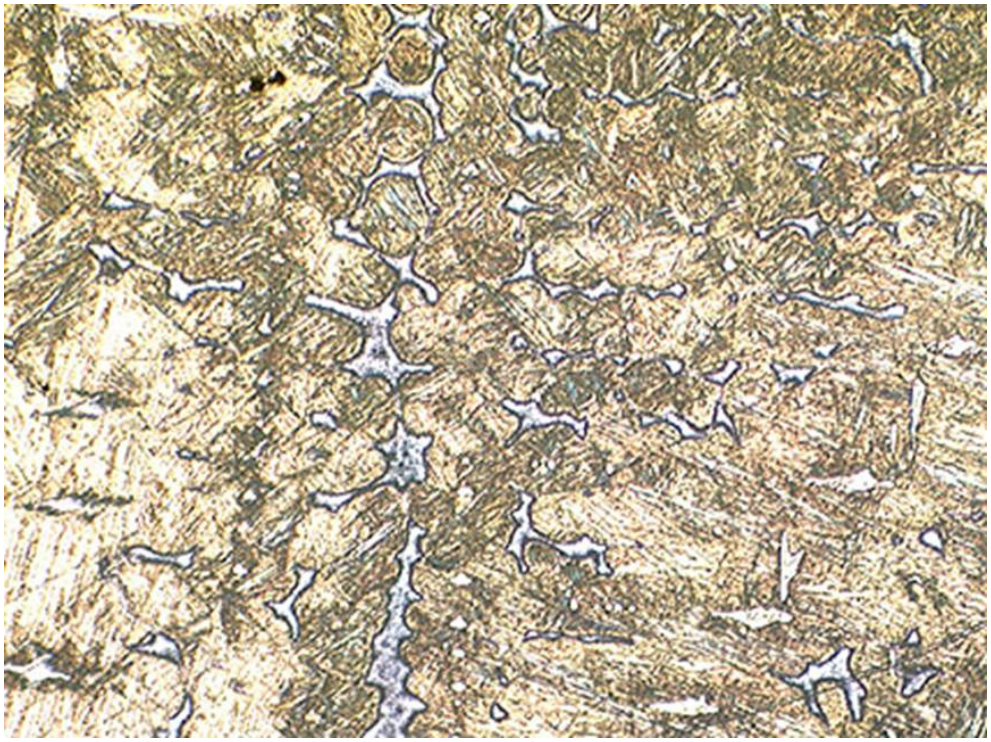
Figure C14. 23% Sn bronze, unpreheated/air-cooled, showing a similar structure to the preheated/air-cooled bronze (fig. C13)



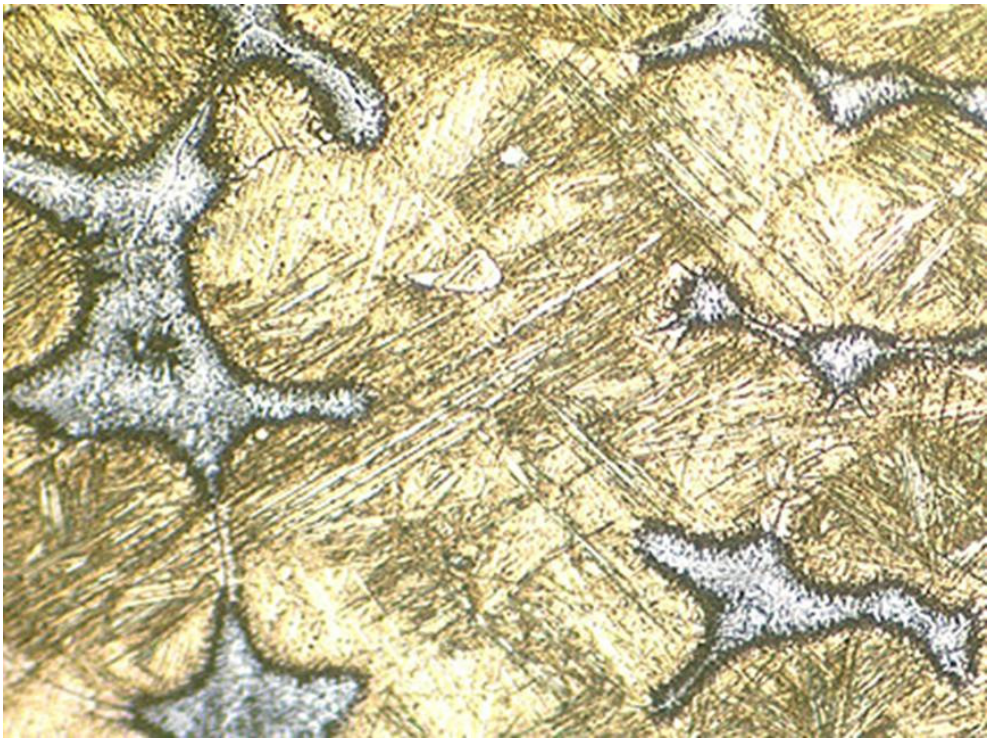
a: Image width 1.3mm



b: Image width 0.33mm



c: Image width 1.3mm



d: Image width 0.33mm

Figure C15. 23% Sn bronze, unpreheated/water-quenched.
a and b showing one part of the sample with a granular structure with needle β as matrix and abnormal δ on the grain boundaries.
c and d showing another part of sample with (dotted grey) δ phase spreading in the matrix of needle β.

Figure C16. 2% Sn +2% Pb bronze, preheated/air-cooled, showing a dendritic structure without α+δ eutectoids. Pb droplets are on the grain boundaries and can hardly be distinguished from pores.
Image width 2.6mm

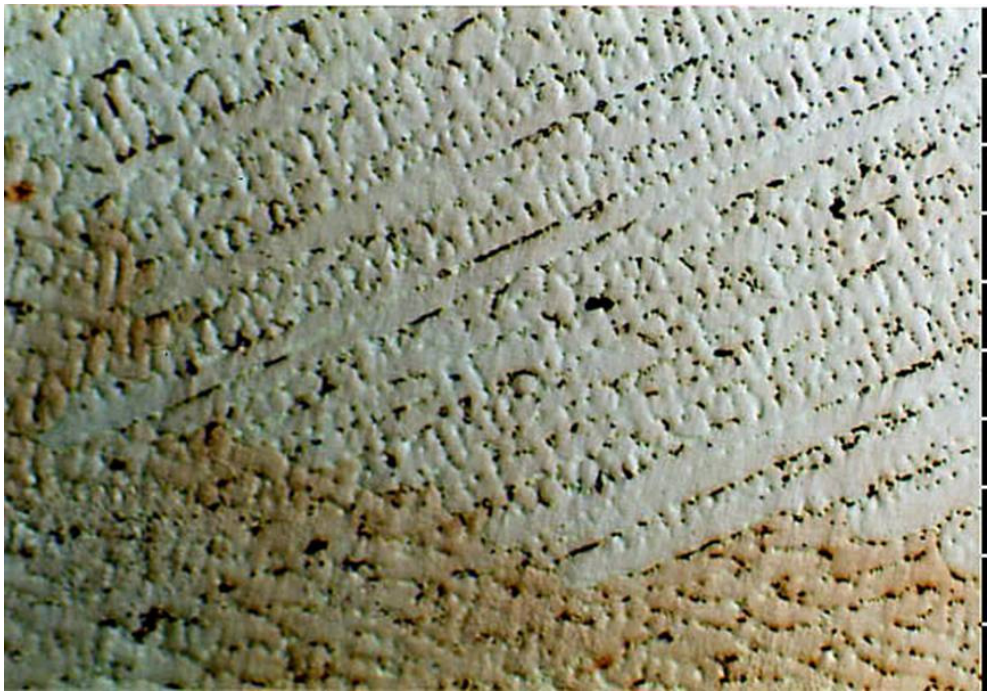
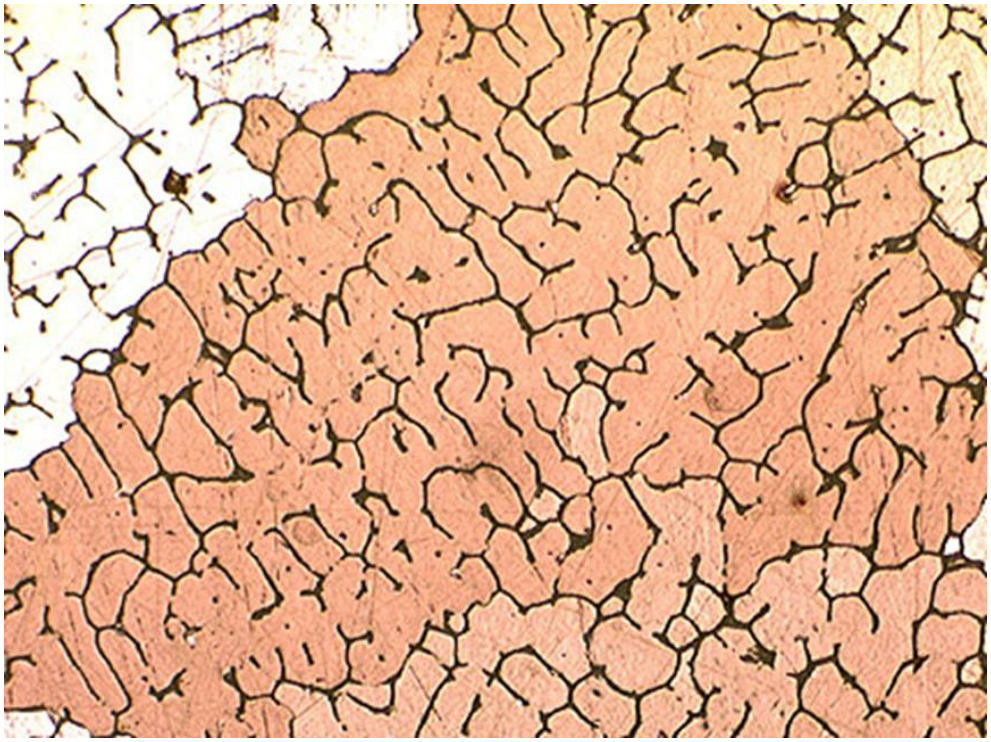
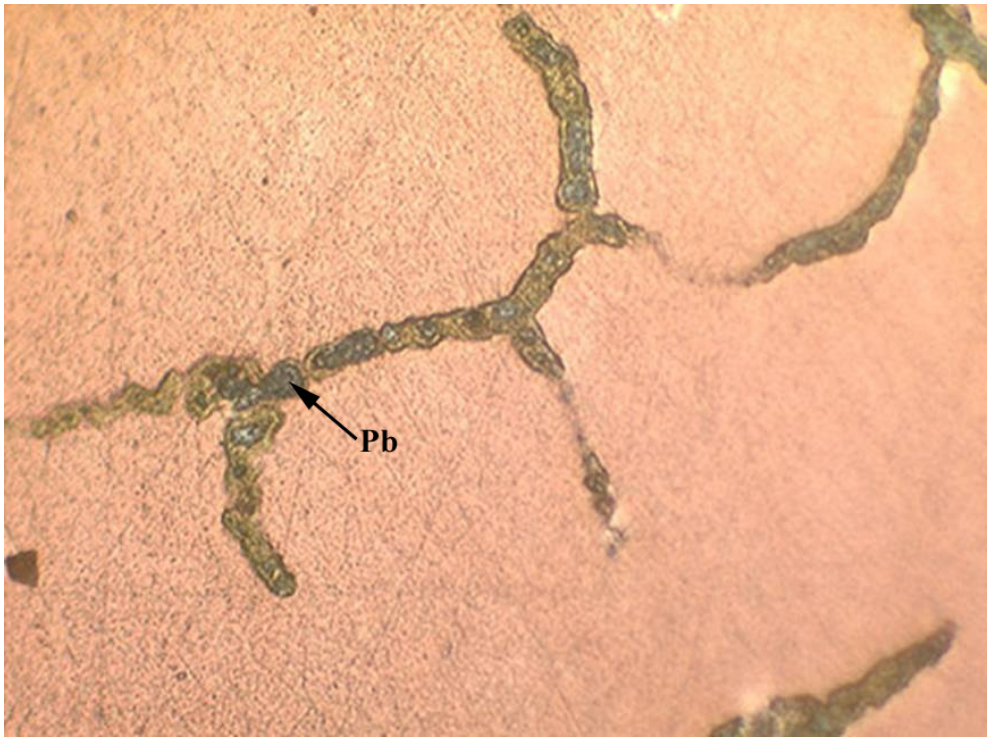


Figure C17. 2% Sn +2% Pb bronze, unpreheated/air-cooled, showing a dendritic structure without α+δ eutectoids. Pb droplets are on the grain boundaries and can hardly be distinguished from pores.
Image width 2.6mm



a: Image width 1.3mm



b: Image width 0.13mm

Figure C18. 2% Sn and 2% Pb bronze, unpreheated/water-quenched, showing pronounced dendritic structure with dark phase, probably δ, in the interdendritic region. Pb droplets are within the dark phase.

Figure C19. 2% Sn + 6% Pb bronze, preheated/air-cooled, showing a granular structure without α+δ eutectoids. Pb droplets are on the grain boundaries
Image width 1.3mm

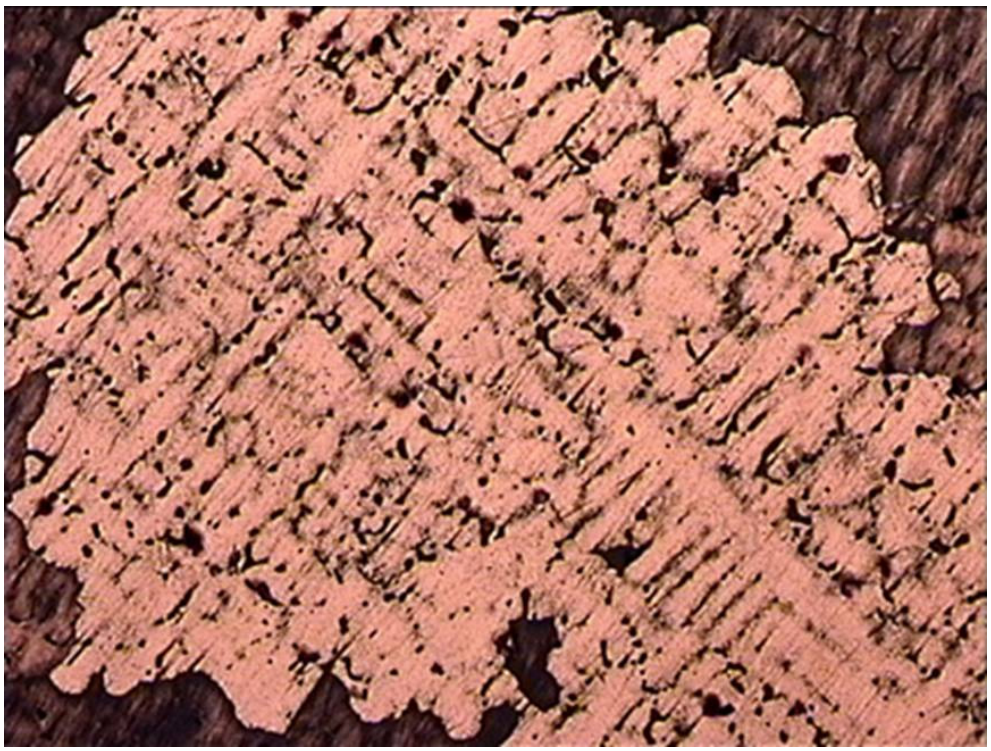
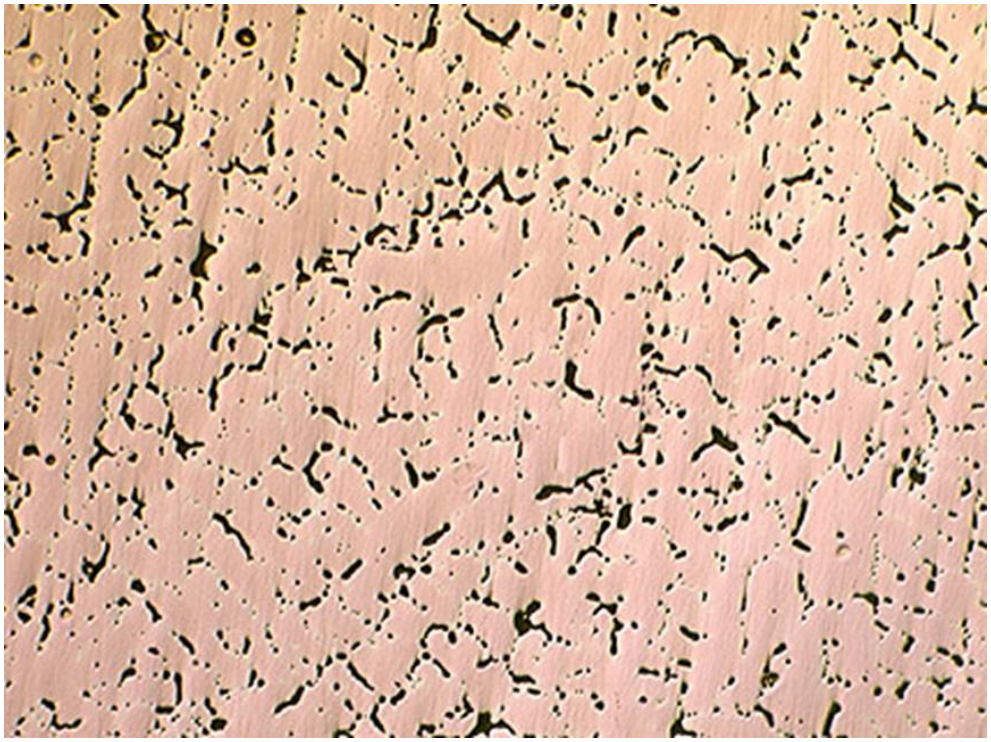
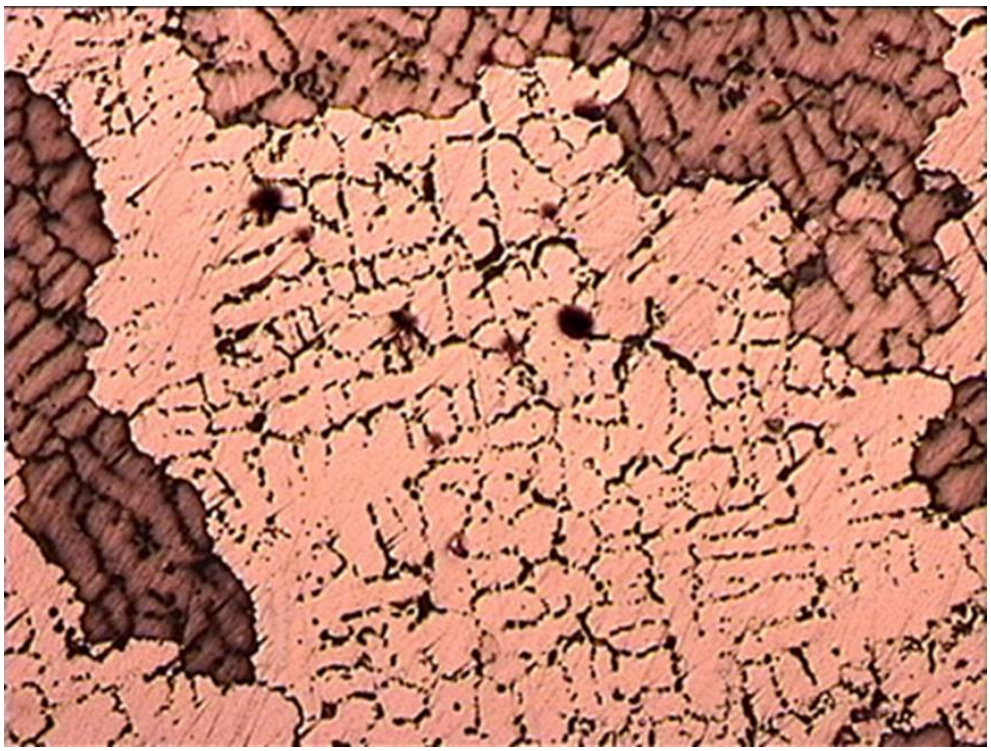


Figure C20. 2% Sn + 6% Pb bronze, unpreheated/air-cooled, showing a dendritic structure without α+δ eutectoids.
Image width 1.3mm



a: Image width 1.3mm; before etching



b: Image width 1.3mm; after etching

Figure C21. 2% Sn + 6% Pb bronze, unpreheated/water-quenched, showing a granular structure without $\alpha+\delta$ eutectoids. The distribution of Pb droplets is more clearly seen in the unetched sample.

a: Image width 1.3mm

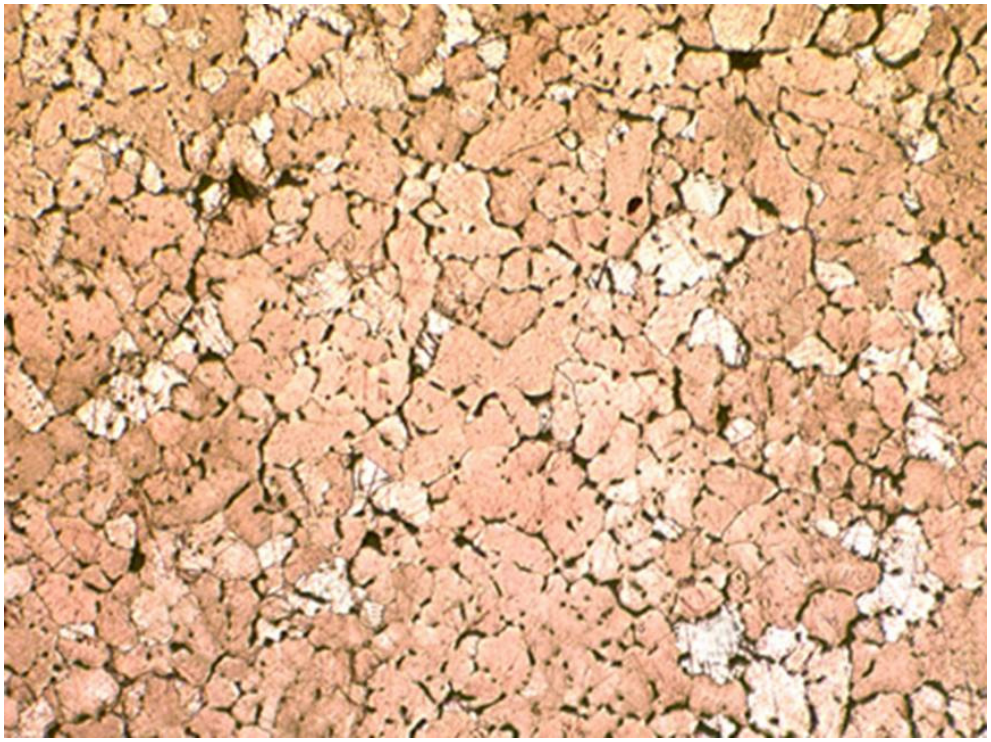
b: Image width 0.65mm

Figure C22. 2% Sn + 10% Pb bronze, preheated/air-cooled, showing a granular structure without α+δ eutectoids. Pb droplets are both on the grain boundaries and within the grains

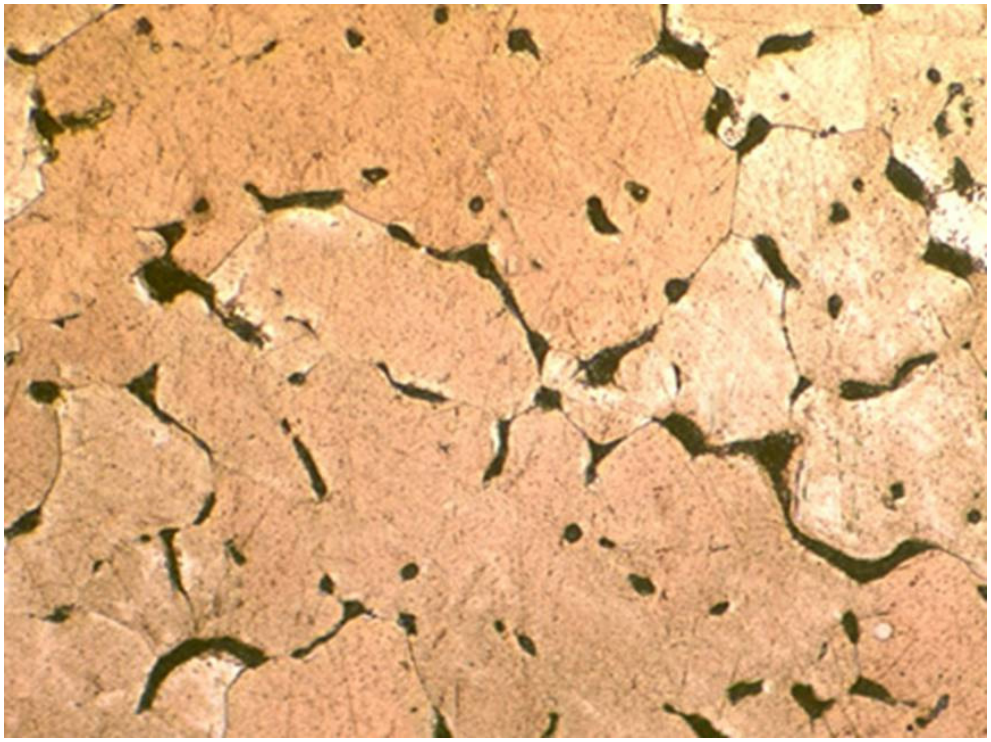
a: Image width 1.3mm

b: Image width 0.65mm

Figure C23. 2% Sn + 10% Pb bronze, unpreheated/air-cooled, showing a very similar structure to the preheated/air-cooled bronze (fig. C22).

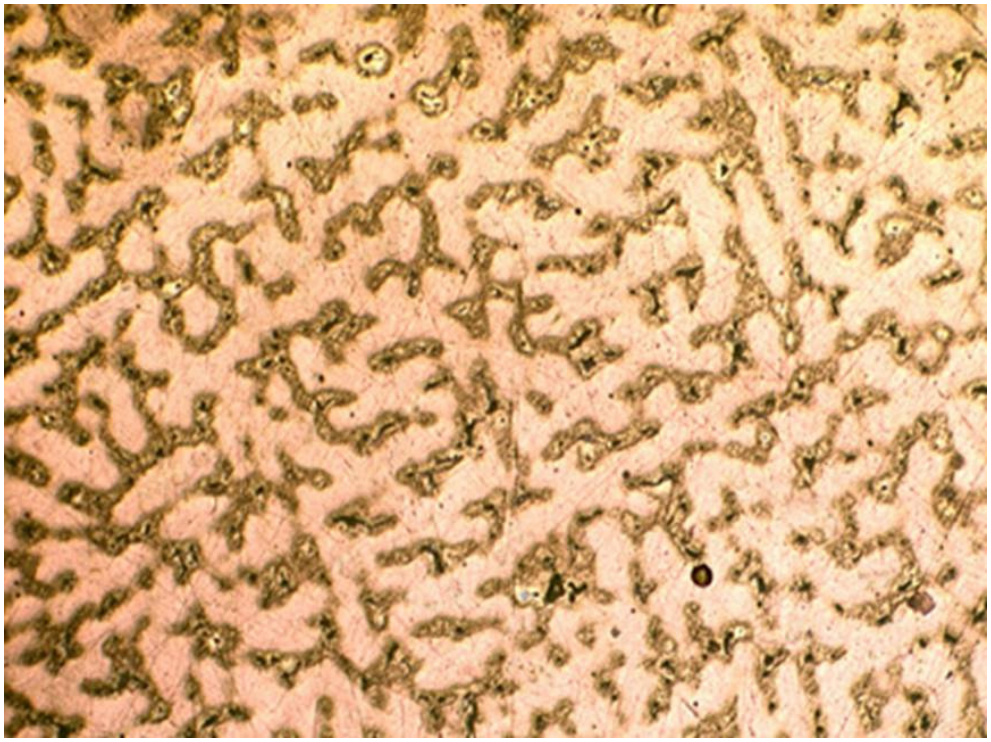


a: Image width 1.3mm

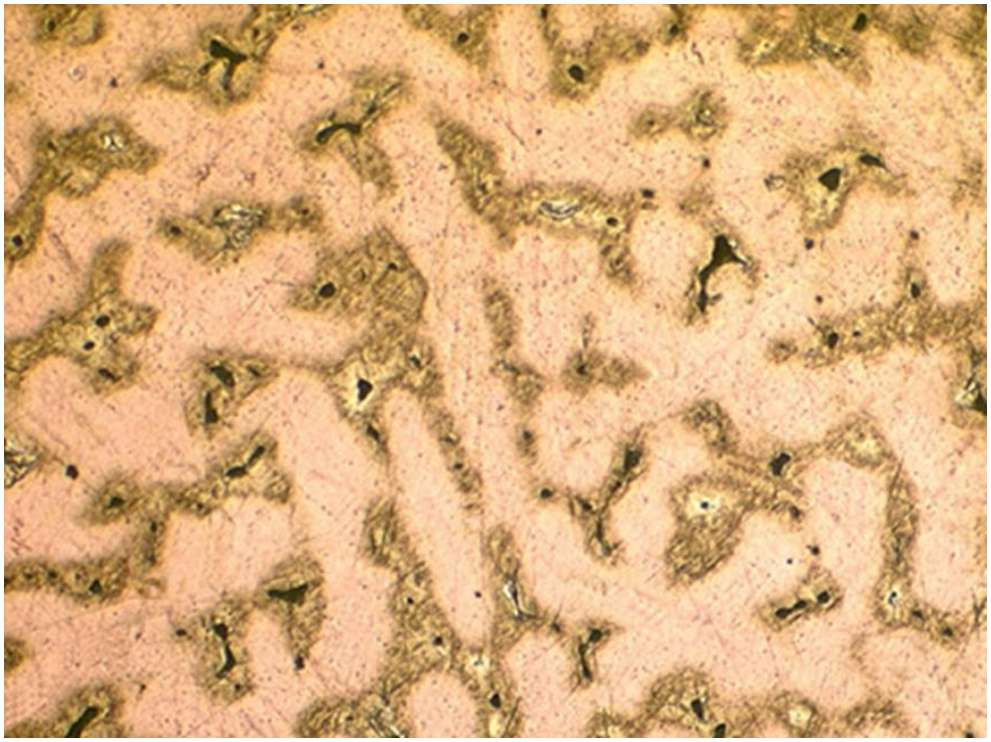


b: Image width 0.33mm

Figure C24. 2% Sn + 10% Pb bronze, unpreheated/water-quenched, showing a granular structure without α+δ eutectoids. Pb droplets are both on the grain boundaries and within the grains.



a: Image width 1.3mm



b: Image width 0.65mm

Figure C25. 6% Sn + 2% Pb bronze, preheated/air-cooled, showing a dendritic structure with very few α+δ eutectoids. Pb is in the interdendritic regions.

Figure C26. 6% Sn + 2% Pb bronze, unpreheated/air-cooled, showing a similar structure to the preheated/air-cooled bronze (fig.C25): dendritic with very few α+δ eutectoids and Pb in the interdendritic regions. Image width 1.3mm

Figure C27. 6% Sn + 2% Pb bronze, unpreheated/water-quenched, showing a pronounced dendritic structure with abnormal (dark) δ phase in the interdendritic regions. Image width 1.3mm

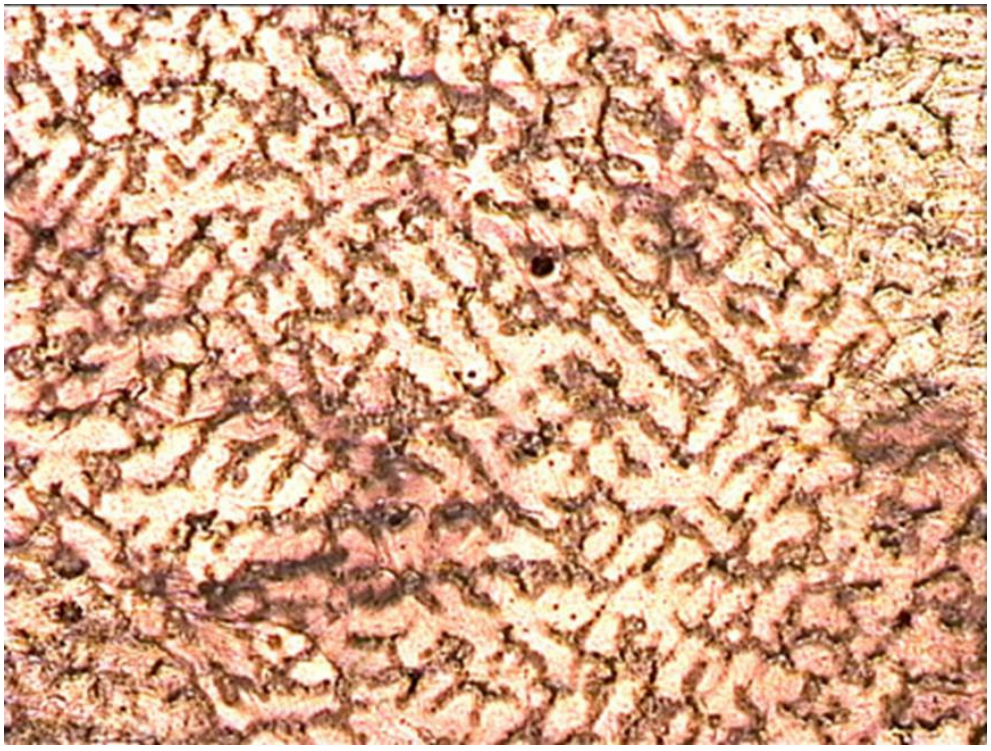


Figure C28. 6% Sn + 6% Pb bronze, preheated/air-cooled, showing a dendritic structure with very few α+δ eutectoids. Image width 1.3mm

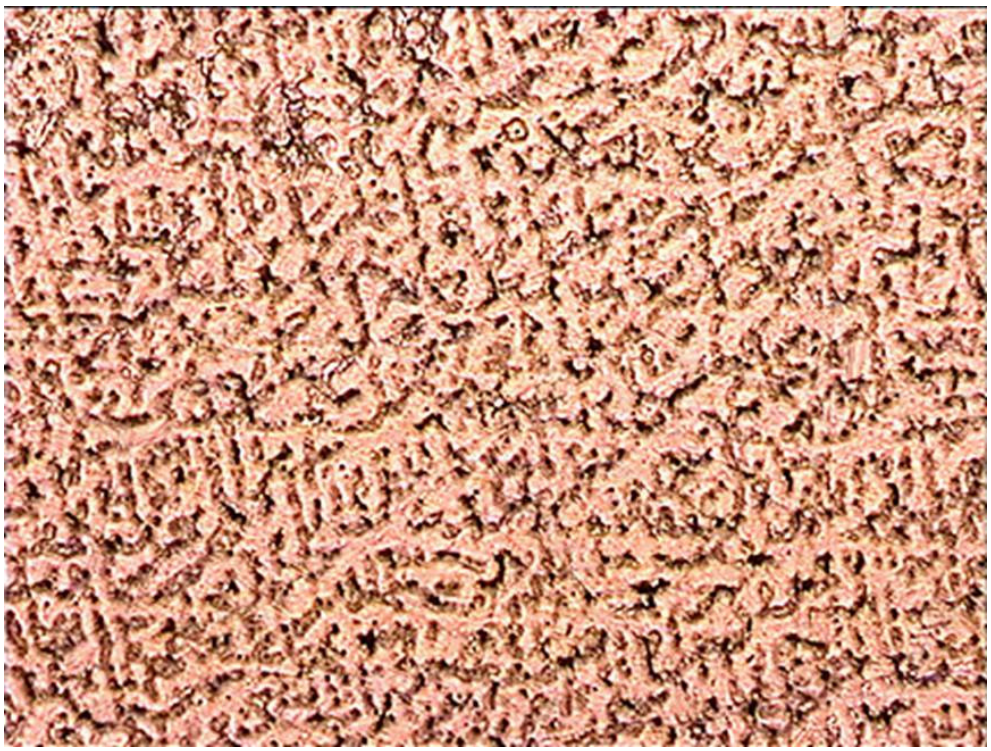
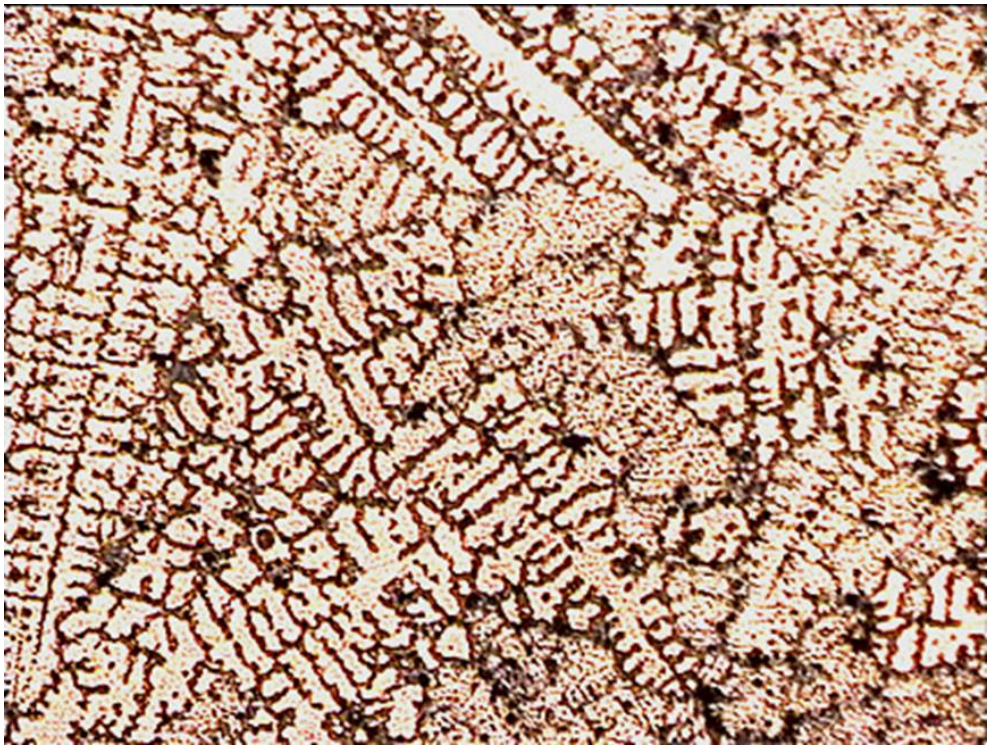


Figure C29. 6% Sn + 6% Pb bronze, unpreheated/air-cooled, showing a similar structure to the preheated/air-cooled bronze (fig. C28), but with smaller dendritic arm spacing. Image width 1.3mm



a: Image width 1.3mm

b: Image width 0.65mm

Figure C30. 6% Sn + 6% Pb bronze, unpreheated/water-quenched, showing a pronounced dendritic structure with abnormal δ phase in the interdendritic regions.

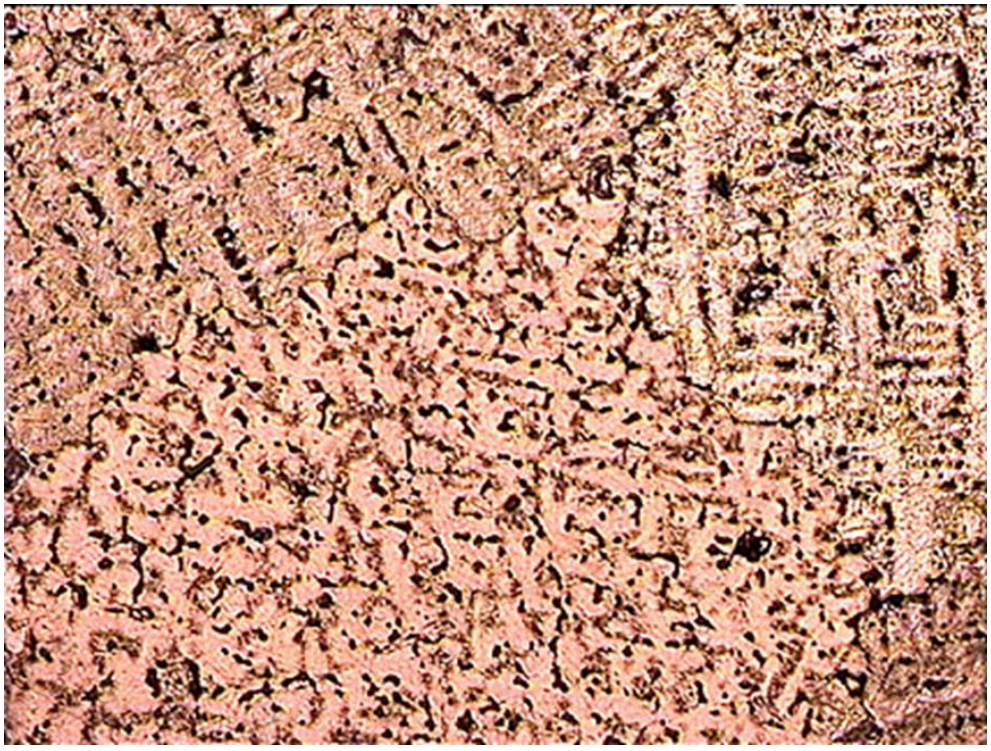


Figure C31. 6% Sn + 10% Pb bronze, preheated/air-cooled, showing a dendritic structure with very few α+δ eutectoids. Image width 1.3mm

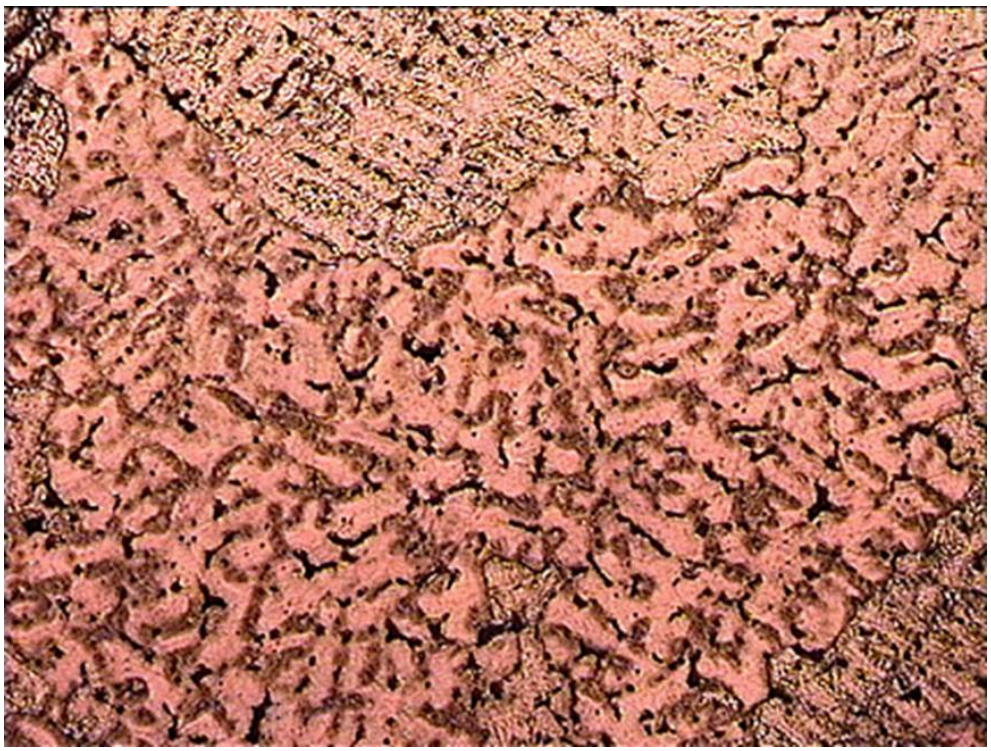
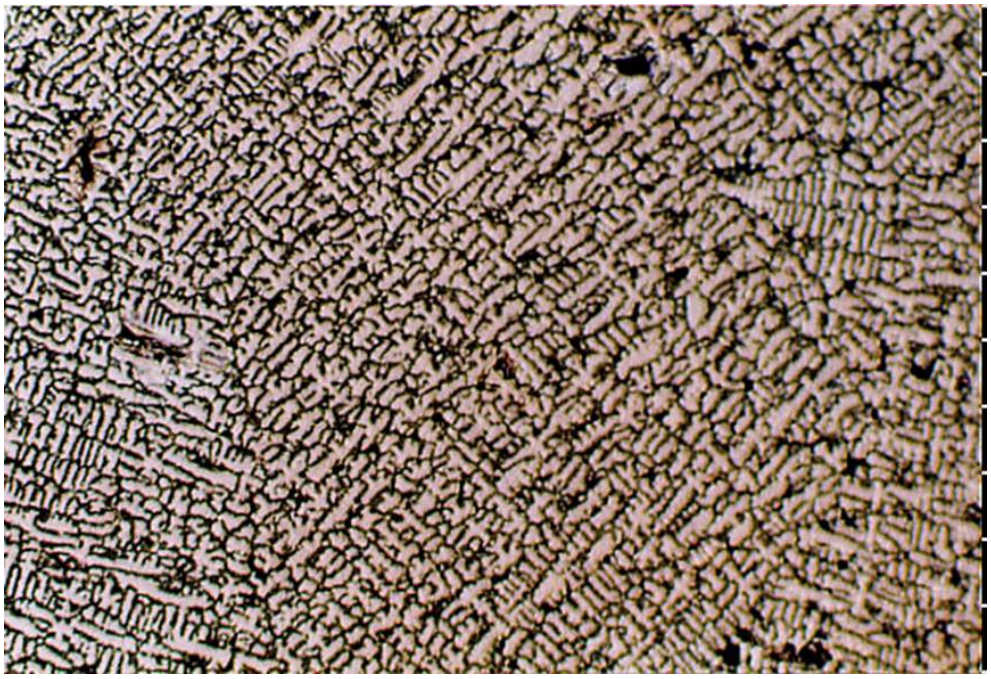
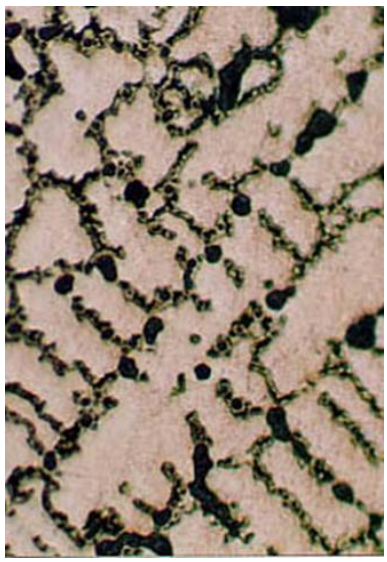


Figure C32. 6% Sn + 10% Pb bronze, unpreheated/air-cooled, showing a similar structure to the preheated/air-cooled bronze (fig. C31). Image width 1.3mm



a: Image width 2.6mm



b: Image width 0.33mm

Figure C33. 6% Sn + 10 %Pb bronze, unpreheated/water-quenched, showing a pronounced dendritic structure with abnormal δ phase in the interdendritic regions.

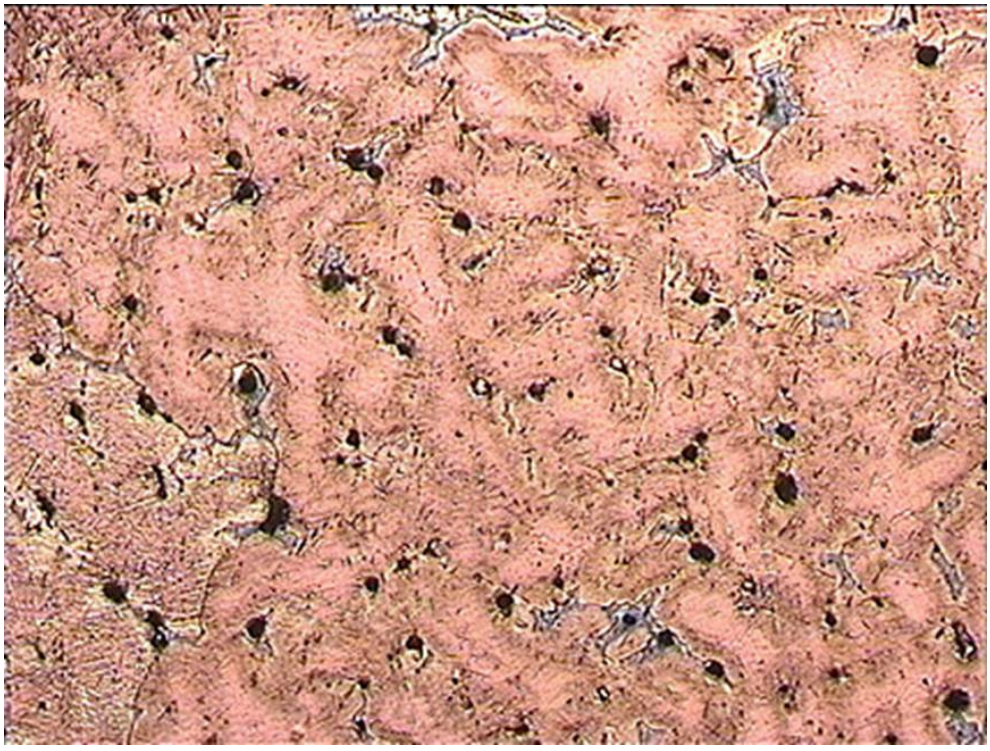


Figure C34. 10% Sn + 2% Pb bronze, preheated/air-cooled, showing a dendritic structure with α+δ eutectoids. Pb droplets are in the interdendritic regions. Image width 0.65mm

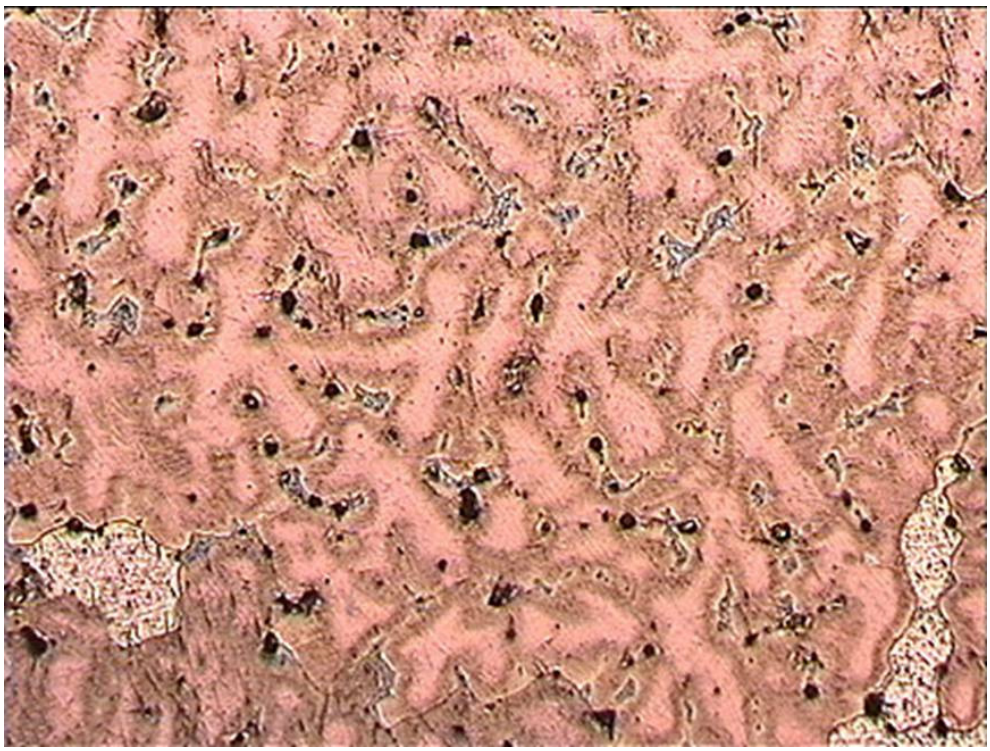


Figure C35. 10% Sn + 2% Pb bronze, unpreheated/air-cooled, showing a very similar structure to the preheated/air-cooled bronze (fig. C34). Image width 0.65mm

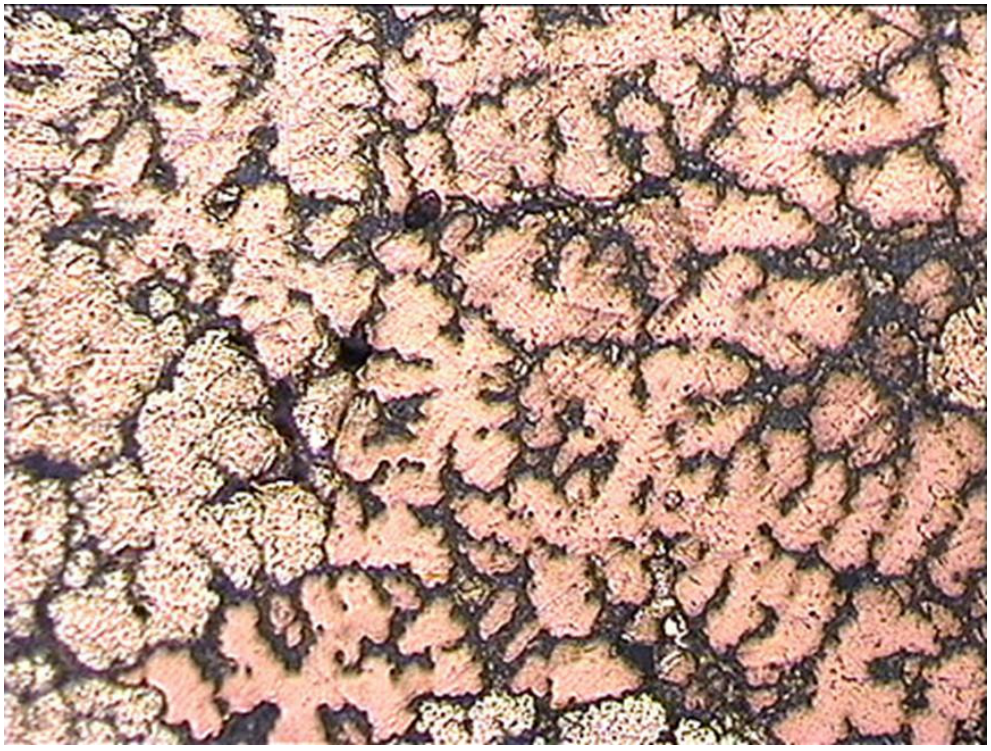


Figure C36. 10% Sn + 2% Pb bronze, unpreheated/water-quenched, showing a dendritic structure with abnormal δ phase in the interdendritic regions. Image width 0.65mm