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Discontinuous precipitation in silver-copper alloys

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Alongside well-studied intragranular precipitation reactions, age-hardening silver copper alloys undergo a range of slower grain boundary initiated transformations including chemically-induced grain boundary migration and cellular precipitation reactions. These are of great interest both for their effect upon mechanical properties and because it has been suggested that the observation of such grain boundary effects offers a means of distinguishing ancient silver objects from modern ones.

Optical and scanning electron microscopy have been used to find the temperature dependence of the overall growth rates of cellular colonies in Ag-7.5Cu and Ag-4.16Cu. Electron backscattered diffraction (EBSD) and transmission electron microscopy (TEM) have been used to determine the crystallographic relationships between the different transformation products and the parent grains. As seen in fig. 1, the extent of transformation varies greatly from boundary to boundary and EBSD has shown that the extent of transformation depends on the boundary plane and the orientation relationship between adjacent grains: extensive cellular growth only proceeds where a colony can form a highly mobile interface with at least one of the grains.

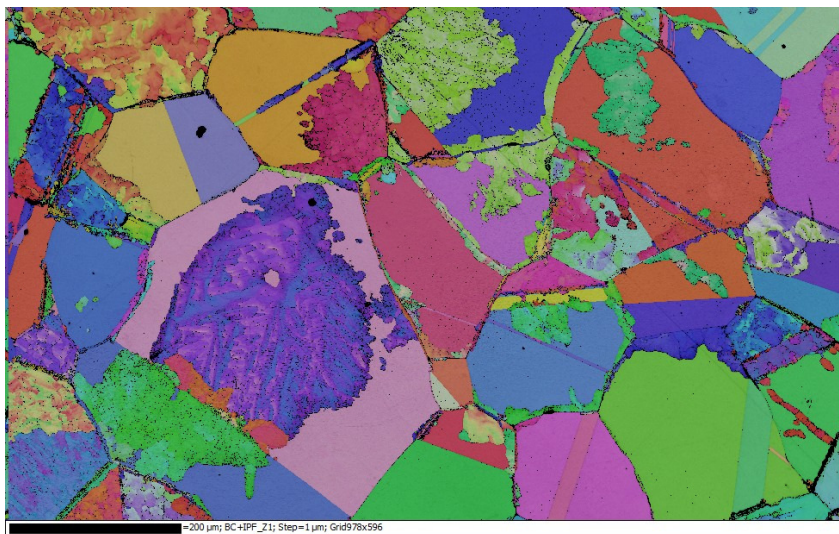


Figure 1. EBSD orientation map of Ag-7.5%Cu aged 3600s at 573K