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Misorientation development near high angle grain boundary and Σ3 boundaries in pure copper and copper - 8 wt. % aluminum alloy

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During deformation of bulk polycrystalline materials, boundaries impose constraints due to requirements of compatibility across boundaries. We have deformed pure bulk Cu and Cu8Al to various strains and studied local misorientation and orientation gradient development near high angle grain boundaries and Σ3 (twin) boundaries. Electron backscattered diffraction (EBSD) was carried out at sub-grain level spatial resolution to characterise the microstructure. Misorientation development was quantified in terms of Kernel Average Misorientation, (KAM). For Cu we find that although misorientation increased with deformation for some cases, it was still lower near the boundary relative to the bulk of the grain. Further evidence of recovery was also found, with decrease in misorientation with increasing strain. In Cu8Al, in comparison, we found more instances of decrease in misorientation with increasing strain, suggesting recovery like processes are dominant. These types of changes have been observed near Σ3 (twin) boundaries as well as high angle grain boundaries. Further, significant increase in misorientation is seen near triple points, due to the constraints imposed on neighbouring grains.

Keywords: EBSD; KAM; Orientation gradient; Grain boundary; Twin boundary

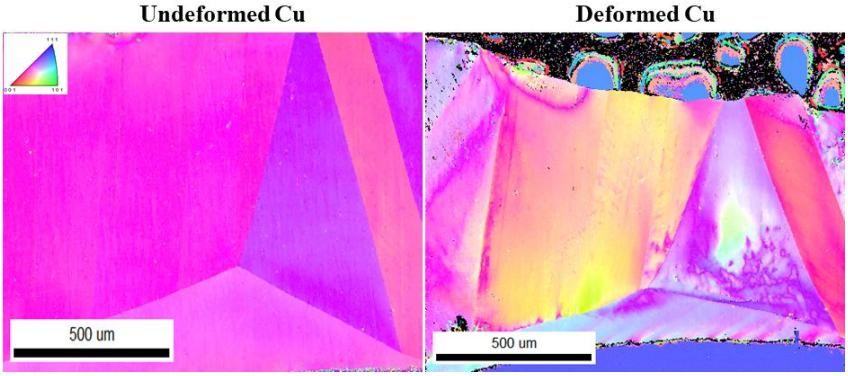

Fig.1: Inverse Pole Figure of Cu