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Preparation of 'Difficult' Samples for EBSD

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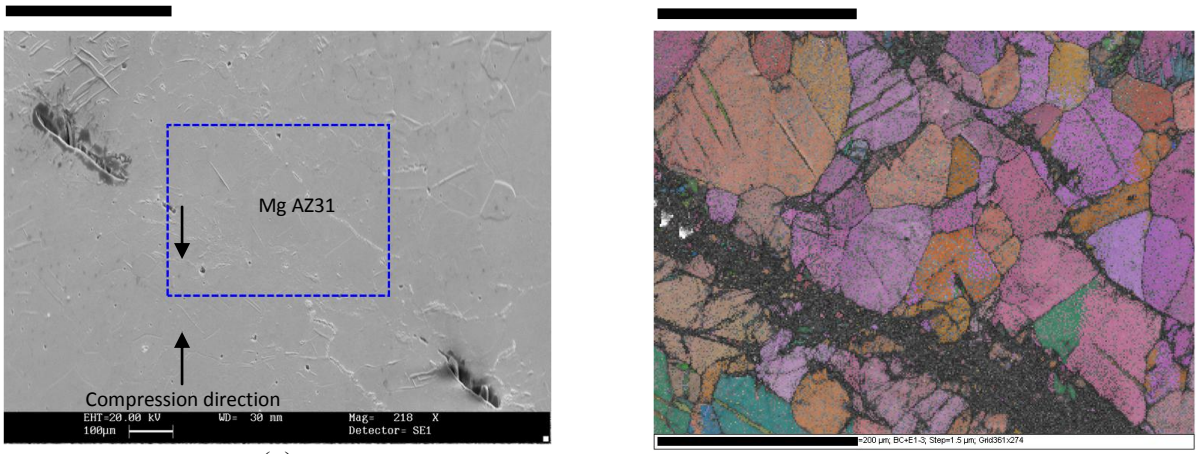
Materials researchers are often confronted with the task of extracting EBSD crystal data from samples that are difficult to prepare. The difficulty may arise for a variety or reasons: there may be inherent lattice damage in the crystal due to processing; there may be large differences in hardness and reactivity between phases due to composition; or it may be that the physical limits of the backscatter mechanism are being approached in terms of the spatial resolution required to see the features of interest.
This study details the sample preparation factors that influence the quality of EBSD data for three cases.

Case one (high degree of lattice damage) discusses preparation of compressed magnesium alloy AZ31 with areas of high localised deformation in the form of shear bands (see figure 1).

Case two (differential phase response) discusses preparation required for samples containing strongly dissimilar phases.

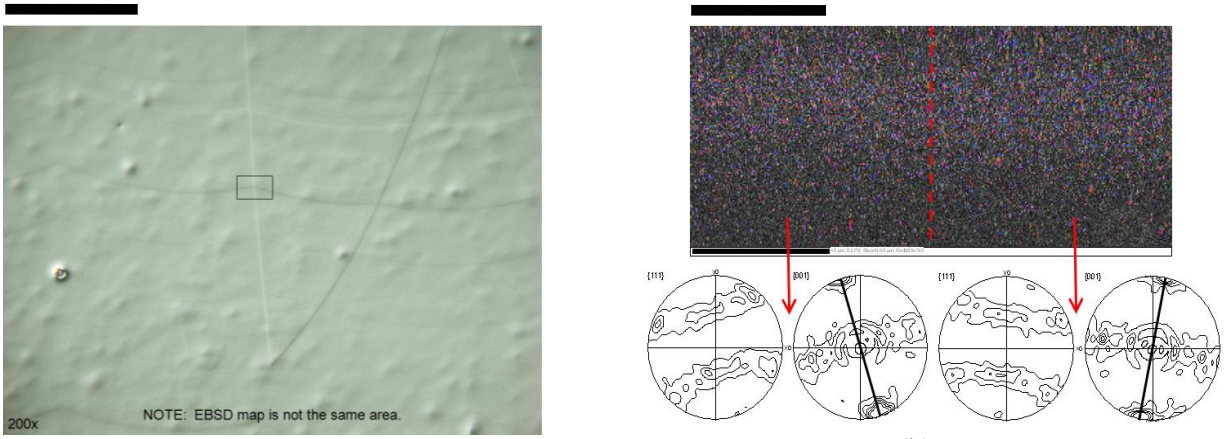
Case three (high spatial resolution requirement) discusses preparation of an electro-deposited nickel alloy with a mean grain size less ~30nm (see figure 2).

Each case is reviewed in terms of the constraints imposed on EBSD data processing by sample preparation.



(a) (b)

Figure 1. Indexing of regions adjacent to shear bands in a magnesium alloy. (a) SE image of the mapped area (Scale bar = 400 µm), (b) Euler angle map of the indicated area (Scale bar = 200µm). [1]



(a) (b)

Figure 2. Electro-deposited nickel (growth axis vertical) showing (a) meso structure (scale bar 300 µm) and (b) texture variation across these zones (scale bar 5µm, map step 50nm). [2]

References

[1] A.P. Sullivan, *Deakin University Internal Document: Experimental preparation of deformed AZ31 for EBSD*, 2008.

[2] M.R. Barnett, P. Cizek, M. Nave, A. Sullivan, R. Balasubramaniam, *Cobblestone mesotexture in a nanocrystalline Ni–20Fe Electrodeposit*, Scripta Materialia 60 (2009) 603–606.

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