Grain orientation mapping in gradient nanostructured metals produced by surface plastic deformation

Surface gradient nanostructured metals characterized by grain size and grain orientation variations from the surface to the interior can be produced by surface plastic deformation. Grain orientation mapping allows a quantitative characterization of both the microstructural and textural gradients that determine the properties and performance of such surface deformed metals. Two-dimensional (2D) orientation mapping techniques in a scanning electron microscope and a transmission electron microscope are typically used to generate grain orientation maps in surface gradient nanostructured metals. In this paper, examples of such grain orientation maps are given to show the advantages and limitations of 2D grain orientation mapping. The challenges associated with the indexing of superimposed electron diffraction patterns are discussed in particular, leading to the conclusion that solving this problem can ultimately only be achieved by 3D orientation mapping.

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