

Microstructure of electroplated magnetite thin films studied by electron-beam diffraction

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Abstract

By means of electron backscatter diffraction (EBSD) [1], we analyse the crystallographic orientation of electroplated magnetite thin films on Si/copper substrates. Varying the voltage during the electroplating procedure, the resulting surface properties are differing considerably [2]. While a high voltage produces larger but individual grains on the surface, the surfaces become smoother on decreasing voltage. Good quality Kikuchi patterns could be obtained from all samples; even on individual grains, where the surface and the edges could be measured. The spatial resolution of the EBSD measurement could be increased to about 10 nm; thus enabling a detailed analysis of single magnetite grains. The typical grain sizes obtained are in the 50 to 200 nm range, and have the shape of round platelets. The thin film samples are polycrystalline and do not exhibit a preferred orientation. EBSD reveals that the grain size changes depending on the processing conditions, while the detected misorientation angles stay similar. The deposition at high voltage leads further to a change of the material itself; as Kikuchi patterns from all samples could be recorded, this phase change can be analysed as well.

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References

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