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Atom probe field ion microscopy of multilayer films

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The nature of intermixing at interfaces in multilayer thin film (MLF) structures is important in determining magnetic properties. Atom probe field ion microscopy has sufficiently high spatial resolution to characterize local structure and composition of MLF devices at the atomic scale. However, a major difficulty has been specimen preparation. Focused ion-beam milling has been used to fabricate field-ion specimens from multilayer film structures consisting of (Cu_{2nm}/Co_{2nm}) or (Cu_{5nm}/$NiFe_{5nm}$) bilayers deposited directly onto planar substrates. This specimen fabrication method has allowed the observation of the structure of these devices, including individual film thickness and curvature as well as grain boundary properties, by field-ion microscopy and composition mapping in a three-dimensional atom probe. In addition, the correlation of structural and chemical observations with magnetic property data from the same thin film structure has been accomplished.

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