Contribution ID: **1424** Type: **Poster (Non-Student) / affiche (non-étudiant)**

The Effect of Electrolyte Additives on Crystallite Orientation in Galvanic Cu Deposits on ⟨111⟩, ⟨100⟩ and ⟨110⟩ Cu Surfaces

Tuesday 14 June 2016 19:08 (2 minutes)

Copper films for applications in printed circuit boards usually have to be fine-grained to achieve even filling of microvias. When galvanically plating Cu films on roll-annealed Cu substrates, unacceptably large epitaxial crystals were found for certain conditions. Here galvanic Cu films were plated on oriented single-crystal Cu substrates from an additive-free electrolyte and from a commercial electrolyte designed for DC plating. The crystallite distribution in the films was mapped with XRD. For the additive-free bath, the transition to a polycrystalline film occurs more readily on ⟨111⟩ and ⟨100⟩ oriented surfaces, whereas films on ⟨110⟩ substrates are persistently epitaxial. A sequence of recursive twinning steps is the main mechanism for the transition to polycrystalline texture. The bath additives promote fine-grained films and they deliver, for the same plating conditions, remarkably improved results.

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Session Classification: DAMOPC Poster Session with beer / Session d'affiches avec bière DPAMPC

Track Classification: Surface Science / Science des surfaces (DSS)