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Properties of magnetic multilayers electroplated with organic additives

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Electrodeposition has been used for centuries to fabricate high purity metal thin films. It was recently found out that adding some organic materials, or so-called, additives in the electrolytes enabled the fabrication of sub-micrometer copper interconnects in semiconductor industry. In addition, they have significant impact on the grain size, surface unoformity, crystalline orientation, and electrical resistivity. Electrochemical analysis of various additives has shown that some additives increase plating current density and others work in the opposite way. We have investigated the effect of these organic materials on copper, nickel and cobalt. An interesting finding is that some additives increasing the current density for one metal can reduce the current density for others and vice versa. We studied the material property of Cu/Co multilayers and the changes caused by these additives. Compared with the thin films fabricated by pure inorganic electrolyte only, the films made by utilizing the organic additives show different crystalline orientations. Under identical plating conditions, adding the organic materials changed the composition of Cu/Ni alloys and altered interface of Cu/Co multilayers. The change of material property has contributed to the change of the magnetic properties such as coercivity and magnetoresistance.

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