Role of Organic Additives on Electrodeposition of Soft Magnetic Alloys

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One of the most important factors in obtaining desired soft magnetic properties of different alloys by electrodeposition (NiFe, CoNiFe, CoFe) is the selection of proper additive in plating bath. This work focused on two organic additives, i.e. saccharin (Sacc) and sodium lauryl sulfate (NaLS) that have been used in industrial production of magnetic alloys for more than three decades.

Generally, adsorbed additives induce the random deposition of ad-atoms, increasing the number of nucleation sites and decreasing the mean free path for lateral diffusion of ad-atoms. This brings about an increase in frequency of two-dimensional nucleation that produces smooth surfaces. The organic additives present in electrolyte solution also change the kinetics and mechanism of electrodeposition.

In this presentation we will discuss the effect of Sacc and NaLS additives on the following: (i) material properties of CoNiFe, (ii) anomalous codeposition of CoNiFe, (iii) inclusion of additives in NiFe and CoNiFe deposits, and (iv) morphology of CoNiFe films.

The external magnetic field, aligned parallel to the easy axis of magnetic film, can affect the mass transport of additives and/or their adsorption-desorption kinetics. The possible role of Sacc and NaLS additives on structure and morphology of NiFe films obtained with and without applied magnetic field will be discussed