Electrodeposition of hard magnetic layers of cobalt and cobalt alloys

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To obtain hard magnetic layers of cobalt or cobalt alloys with a noticeable magnetic moment, electrodeposition is the most viable method in an industrial perspective. It is possible to obtain layers with different preferred orientations controlling the bath composition and operative conditions. The conditions to obtain the desired properties are reviewed.

Cobalt can be obtained with different structure and preferred orientation from simple baths, depending on bath pH and deposition current density. At low pH *fcc* outgrowth prevails and *hcp* Co is deposited with POs having most densely packed plane perpendicular to the surface, at very high pH inhibition conditions are obtained and lateral growth occurs from baths without boric acid with most densely packed plane parallel to the surface. These layers are interesting for perpendicular recording media and can have high coercivities in condition of cellular growth.

Among Co alloys, Co-Pt, Co-W and Co-Zn are able to give strong POs depending on the bath pH and composition. For magnetic films it is possible to control the structure growth with electrodeposition even at high thickness. We were able to deposit thick (> 30 mm) layers of Co-Pt(P) alloys, with easy plane parallel to the substrate, from complexed alkaline electrolytes having high coercivity (2÷4 kOe) and high magnetic moment. Co-Pt-W(P) and Co-Pt-Zn(P) alloys were also obtained from Co sulfamate solutions containing metal salts, hypophosphite and complexed with ammonium citrate and glycine at pH 8 and 60°C, with a Pt equivalent content in the range 8÷24 at%, varying deposition conditions and solution composition. Shape of hysteresis loops and differences between coercivities, in external magnetic field parallel or perpendicular to the surface, can be related to the deposit composition, microstructure and POs.