

[54] AMORPHOUS METALLIC AND NITROGEN CONTAINING ALLOY FILMS

[75] Inventors: Jerome J. Cuomo, Lincolndale; Amitava Gangulee, Croton-on-Hudson; John Kobliska, Mount Kisco, all of N.Y.

[73] Assignee: International Business Machines Corporation, Armonk, N.Y.

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Primary Examiner—L. Dewayne Rutledge

Assistant Examiner—John P. Sheehan

Attorney, Agent, or Firm—Graham S. Jones, II

[57] ABSTRACT

These amorphous metal-alloy films include nitrogen, greater than about one atomic percent at least one transition metal selected from Cr, Fe, Co and Ni with at least one element forming an amorphous alloy therewith, selected from the "glass forming" elements, i.e., B, Si, Al, C and P. The alloys can be formed by deposition in a vacuum chamber. When films are sputtered, the target is composed of the above alloy elements with at least one element selected from each of the transition metal and glass forming element groups. Sputtering occurs in an atmosphere above about 2% vol. N₂ gas mixed with an inert gas, e.g., Ar. Alloys produced include N, i.e., (Co-Fe-B)N and (Fe-B)N. Above about 2 atomic % N in the film, films have lower values of saturation magnetization 4πM_s. Above a 2% vol. N₂ gas in the plasma, electrical resistivity increases. Over 0.5% vol. N₂ gas in the plasma, the film's effective perpendicular anisotropy field H_k^{*} increases. For (Co-Fe-B)N, the anisotropy direction moves from in plane to perpendicular above 2% vol. N₂ plasmas. For (Fe-B)N, H_k^{*} increases with N₂ up to 10% vol. N₂ plasma. The N% in a film varies linearly with the log of N₂% vol. Films show markedly improved adhesion, corrosion resistance and hardness. Magnetic thermal stability increases with N₂ above about 5% vol. N₂ in a plasma. Structural and magnetic properties are stable for annealing up to 400° C.

12 Claims, 4 Drawing Figures