will have grain separation sufficient for the intended bit density. Any suitable recording structure configuration can be used as desired.

A thin hard continuous magnetic layer 206 is formed on the recording structure 204. This layer 206, sometimes referred to herein as a stabilization layer, in some embodiments may be significantly thinner than the overall thickness of the recording structure 204, such as $1/10^{th}$ the thickness or thinner. In some embodiments, the layer 206 may be on the order of less than 15 angstroms (A) and may have values of magnetic saturation (Ms) greater than about 600 ~~e+~~emu/$cm^2$ and anisotropic field strengths (Hk) of greater than about 15,000 Oersteds (Oe). The layer 206 generally operates to stabilize the top portion of the recording layers by providing a high level of exchange coupling to the top portion of the recording layers. As desired, a carbon overcoat layer (COC) 208 may be formed on the top magnetic layer 206 for wear and corrosion protection, and a thin layer of lubricant 210 may be applied to the COC layer.

FIG. 3 shows a cross-section of a recording medium 300 in accordance with other embodiments. The layers are generally representational and are not necessarily drawn to scale. Layers include substrate 302, SUL 304, IL 306, RL 308, stabilization layer 310, COC 312, and lubricant 314. The stabilization layer (e.g., layers 208, 310) can take any suitable form. In some embodiments the stabilization layer is provided with a low Boron (B) content and a relatively high platinum (Pt) content. Such configurations have been found to significantly increase Ms and Hk levels.

With regard to the exemplary structures shown in FIGS. 2 and 3, the substrate can be any substrate that is suitable for magnetic recording media, including Al and glass. The soft magnetic underlayer (SUL) may be sputtered onto the substrate. The interlayer(s) (IL) establish a crystalline orientation base to induce the growth of hcp (0002) in the magnetic layer, with a magnetic easy axis perpendicular to the film plane. The interlayer(s) also establish a high surface roughness to induce grain separation in the subsequently deposited magnetic layers. The magnetic recording layers, as mentioned above, may comprise three or more layers (granular bottom magnetic layers, granular intermediate layer and top continuous magnetic layers) for the best recording performance. The overcoat is carbon layer.

Claims:

1. A perpendicular data recording medium, comprising:

a multi-layer recording structure formed on a base substrate and adapted to magnetically store a magnetic bit sequence in domains substantially perpendicular to said layers; and

a thin magnetic stabilization layer formed on the multi-layer recording ~~substrate~~ structure to magnetically stabilize an upper portion of the multi-layer recording structure, the magnetic stabilization layer comprising a non-zero boron (B) content of less than about 6% and a platinum (Pt) content of about 20-25%.

2. The medium of claim 1, in which the magnetic stabilization layer comprises a thin layer of continuous, hard magnetic material with a thickness of from about 40 to 60 angstroms.

~~3. The medium of claim 1, in which the magnetic stabilization layer further comprises a non-zero boron (B) content of less than about 6%.~~

~~4~~3. The medium of claim 1, in which the magnetic stabilization layer provides a magnetic saturation level of greater than about 600 ~~e~~emu/cm$^2$ and anisotropic field strengths (Hk) of greater than about 15,000 Oersteds (Oe).

~~5~~4. The medium of claim 1, in which the multi-layer recording structure is an ECC+CGC recording structure.

~~6~~5. The medium of claim 1, in which the multi-layer recording structure comprises a soft underlayer, at least one intermediate layer, and at least one magnetic recording layer, wherein the magnetic stabilization layer is formed on a topmost one of the at least one magnetic recording layer.

~~7~~6. The medium of claim ~~6~~5, in which the magnetic stabilization layer has a thickness that is less than 1% of the thickness of the topmost one of the at least one magnetic recording layer.

~~8~~7. The medium of claim 1, further comprising a carbon overcoat layer formed on the magnetic stabilization layer.

~~9~~8. A perpendicular data recording medium, comprising:

a multi-layer recording structure adapted to magnetically store a magnetic bit sequence in domains substantially perpendicular to said layers; and

a thin hard magnetic layer on the multi-layer recording ~~substrate~~ structure to magnetically stabilize an upper portion of the multi-layer recording structure, the thin hard magnetic layer having a thickness of less than 1% of a topmost recording layer of the multi-layer recording structure.

~~10~~9. The medium of claim ~~9~~8, in which the thin hard magnetic layer comprises a non-zero boron (B) content of less than about 6%.

~~11~~10. The medium of claim ~~10~~9, in which the thin hard magnetic layer further comprises a platinum (Pt) content of about 20-25%.

~~12~~11. The medium of claim ~~9~~8, in which the thin hard magnetic layer provides a magnetic saturation level of greater than about 600 ~~e~~emu/cm$^2$ and anisotropic field strengths (Hk) of greater than about 15,000 Oersteds (Oe) for the medium.

~~13~~12. The medium of claim ~~9~~8, in which the multi-layer recording structure is an ECC+CGC recording structure.

~~14~~13. The medium of claim ~~9~~8, in which the multi-layer recording structure comprises a soft underlayer, at least one intermediate layer, and at least one magnetic recording layer, wherein the thin hard magnetic layer is formed on a topmost one of the at least one magnetic recording layer.

~~15~~14. The medium of claim ~~9~~8, further comprising a carbon overcoat layer formed on the thin hard magnetic layer.

~~16~~15. A perpendicular data recording medium, comprising:

a multi-layer recording structure adapted to magnetically store a magnetic bit sequence in domains substantially perpendicular to said layers; and

means for magnetically stabilizing an upper portion of the multi-layer recording structure comprising a thin hard magnetic layer on the multi-layer recording ~~substrate~~ structure having a non-zero boron (B) content of less than about 6% and a platinum (Pt) content of about 20-25%, and in which the thin hard magnetic layer provides a magnetic saturation level of greater than about 600 ~~e~~emu/cm$^2$ and anisotropic field strengths (Hk) of greater than about 15,000 Oersteds (Oe) for the medium.

~~17~~16. The medium of claim ~~16~~15, in which the thin hard magnetic layer on the multi-layer recording ~~substrate~~ structure has a thickness of less than 1% of a topmost recording layer of the multi-layer recording structure.