What is claimed is:

1. A method of protecting patterned magnetic materials of a stack, comprising:

depositing a thin continuous film of an inert material that is inert to the magnetic materials of a patterned stack upon which the thin continuous film is being deposited; and

forming a thin interim interface layer from the thin continuous film to protect top and sidewall areas of non-etched higher relief magnetic islands and magnetic film etched surfaces of the patterned stack from air exposure damage and damage from contact with backfilled materials.

2. The method of claim 1, wherein the inert material is configured to prevent changes to magnetic properties of the magnetic islands and magnetic films of the patterned stack.

3. The method of claim 1, wherein the inert material is configured to prevent a chemical reaction with the magnetic materials of a patterned stack.

4. The method of claim 1, wherein the inert material is configured to prevent diffusion of the magnetic materials of a patterned stack.

5. The method of claim 1, wherein depositing the thin continuous film includes at least one of sputtering, plasma-enhanced chemical vapor deposition, atomic layer deposition or conformal deposition.

6. The method of claim 1, wherein the thin interim interface layer includes a planarization processes.

7. The method of claim 1, wherein the thin interim interface layer is configured to insulate magnetic island from surrounding elements including air and backfilled materials.

8. The method of claim 1, wherein the thin interim interface layer is configured to create magnetic island sidewall protection from damage during planarization and etch back processes.

9. The method of claim 1, wherein the thin continuous film is deposited over freshly patterned magnetic islands subsequently after ion beam etching patterning in a vacuum.

10. An apparatus, comprising:

means for depositing a thin continuous film of an inert material that is inert to the magnetic materials of a patterned stack upon which the thin continuous film is being deposited; and

means for forming a thin interim interface layer from the thin continuous film to protect top and sidewall areas of non-etched higher relief magnetic islands and magnetic film etched surfaces of the patterned stack from air exposure damage and damage from contact with backfilled materials.

11. The apparatus of 10, further comprising means for creating a thin interim interface layer structure in a patterned stack to protect magnetic islands during planarization processes.

12. The apparatus of 10, further comprising means for depositing the inert material to prevent changes to magnetic properties of the patterned stack.

13. The apparatus of 10, wherein the means for depositing the thin continuous film includes at least one of means for sputtering, means for plasma-enhanced chemical vapor deposition, means for atomic layer deposition or means for conformal deposition.

14. The apparatus of 10, further comprising means for creating a thin interim interface layer structure in a patterned stack to protect magnetic islands from diffusion damage by direct contact with backfilled materials.

15. The apparatus of 10, further comprising means for depositing the thin continuous film over freshly patterned magnetic islands of a patterned stack subsequently after ion beam etching patterning in a vacuum.

16. A protective layer structure, comprising:

patterned magnetic islands;

a thin interim interface layer; and

a thin continuous film protective layer structure, wherein the thin interim interface layer is formed by depositing the thin continuous film protective layer structure upon the patterned magnetic islands to protect the patterned magnetic islands from air exposure damage, damage from contact with backfilled materials and damage from planarization processes.

17. The protective layer structure of claim 16, wherein the materials deposited upon patterned magnetic islands are inert to magnetic materials used in the patterned islands.

18. The protective layer structure of claim 17, wherein the inert materials deposited upon patterned magnetic islands are configured to prevent changes in the magnetic properties of the magnetic islands and magnetic films of a patterned stack, to prevent a chemical reaction with the magnetic materials of a patterned islands and to prevent diffusion of the magnetic materials of a patterned islands.

19. The protective layer structure of claim 16, wherein the protective layer is deposited using a deposition process, including at least one of sputtering, plasma-enhanced chemical vapor deposition, atomic layer deposition or conformal deposition techniques.

20. The protective layer structure of claim 16, wherein the thin interim interface layer is configured to protect the patterned magnetic islands during planarization processes including etch back of the backfilled materials.

What is claimed is:

1. A method comprising:

forming a mask over a magnetic layer;

etching the magnetic layer through the mask to form magnetic features in an etched magnetic layer, wherein a residual mask covers tops of the magnetic features subsequent to etching the magnetic layer;

depositing a conformal film over the etched magnetic layer, wherein the conformal film covers the residual mask, sidewalls of the magnetic features, and areas of the etched magnetic layer in-between the magnetic features;

depositing a backfilling material over the conformal film; and

planarizing to at least the residual mask.

2. The method of Claim 1, wherein the mask and the residual mask are carbon.

3. The method of Claim 1 or 2, wherein the conformal film is deposited in a thickness of 2 nm.

4. The method of any one of Claims 1 to 3, wherein the conformal film protects the magnetic features from oxidation by air exposure and chemical reaction by contact with the backfilling material.

5. The method of any one of Claims 1 to 4, wherein planarizing to at least the residual mask comprises planarizing to and exposing the tops of the magnetic features.

6. The method of any one of Claims 1 to 5, further comprising depositing a carbon overcoat subsequent to planarizing to and exposing the tops of the magnetic features.

7. A method comprising:

etching a magnetic layer through a mask to form magnetic features in an etched magnetic layer, wherein a residual mask covers tops of the magnetic features subsequent to etching the magnetic layer;

depositing a conformal film over the etched magnetic layer, wherein the conformal film covers the residual mask, sidewalls of the magnetic features, and areas of the etched magnetic layer in-between the magnetic features;

depositing a backfilling material over the conformal film and over the residual mask, wherein the backfilling material backfills areas of the etched magnetic layer in-between the magnetic features; and

planarizing to at least the residual mask.

8. The method of Claim 7, wherein the conformal film is deposited over the etched magnetic layer under a vacuum.

9. The method of Claim 7 or 8, wherein the conformal film protects the magnetic features from oxidation by air exposure.

10. The method of any one of Claims 7 to 9, wherein the conformal film is deposited in a thickness of about 2 nm

11. The method of any one of Claims 7 to 10, wherein planarizing to at least the residual mask comprises planarizing to and exposing the tops of the magnetic features.

12. The method of any one of Claims 7 to 11, further comprising depositing a carbon overcoat subsequent to planarizing to and exposing the tops of the magnetic features.

13. A method comprising:

etching a magnetic layer through a mask to form magnetic features in an etched magnetic layer, wherein a residual mask covers tops of the magnetic features subsequent to etching the magnetic layer;

depositing a conformal film over the etched magnetic layer, wherein the conformal film covers the residual mask, sidewalls of the magnetic features, and areas of the etched magnetic layer in-between the magnetic features;

depositing a backfilling material over the conformal film; and

planarizing to and exposing the tops of the magnetic features.

14. The method of Claim 13, wherein the conformal film is deposited in a thickness of 2 nm.

15. The method of Claim 13 or 14, wherein the conformal film is deposited by plasma-enhanced chemical vapor deposition.

16. The method of any one of Claims 13 to 15, wherein the conformal film is deposited by atomic layer deposition.

17. The method of any one of Claims 13 to 16, wherein the conformal film protects the magnetic features from chemical reaction by contact with the backfilling material.

18. The method of any one of Claims 13 to 17, wherein depositing the backfilling material comprises depositing the backfilling material up to a height of the residual mask.

19. The method of any one of Claims 13 to 17, wherein depositing the backfilling material comprises depositing the backfilling material over the height of the residual mask.

20. The method of any one of Claims 13 to 19, further comprising depositing a carbon overcoat subsequent to planarizing to and exposing the tops of the magnetic features.