Claims

1. A metallic substrate with a multi-layer coating, comprising in order:
   i) the metallic substrate;
   ii) a seed layer;
   iii) a barrier layer comprising DLC deposited via a CVD method; and
   iv) a functional layer comprising ta-C deposited via a PVD method; and

wherein the overall thickness of the coating is 5µm or less.

2. A coated substrate according to claim 1 comprises multiple alternating barrier layers and functional layers.

3. A coated substrate according to claim 2 comprising alternating layers of up to 10 barrier layers and up to 10 functional layers

4. A coated substrate according to any one of claims 1 to 3 which further comprises an intermediate layer between the seed layer ii) and the barrier layer iii)

5. A coated substrate according to claim 4 wherein the intermediate layer comprises ta-C.

6. A coated substrate according to any of claims 1 to 5 wherein the total thickness of all barrier layers in the substrate is up to 1.0µm.

7. A coated substrate according to any of claims 1 to 6 wherein the total thickness of all barrier layers in the substrate is from 0.05µm to 0.5µm.

8. A coated substrate according to any of claims 1 to 7 wherein the thickness of the functional layer is from 0.1µm to 3µm.

9. A coated substrate according to any of claims 1 to 8 wherein the thickness of the seed layer is from 0.05µm to 2µm.

10. A coated substrate according to any of claims 1 to 9 wherein the functional layer(s) is/are deposited by FCVA.

11. A coated substrate according to any of claims 1 to 10 wherein the seed layer is formed from Cr, W, Ti, NiCr, Si or mixtures thereof.

12. A coated substrate according to any of claims 1 to 11 wherein the substrate is a steel substrate.

13. A coated substrate according to claim 12 wherein the substrate comprises stainless steel, HSS, tool steel or alloy steel.

14. A coated substrate according to any of claims 1 to 11 wherein the substrate comprises Ti, an alloy of Ti, Al or an alloy of Al.

15. A coated substrate according to any of claims 1 to 14, comprising at least 2 barrier layers and at least 2 functional layers.

16. A coated substrate according to any of claims 1 to 15, comprising at least 3 barrier layers and at least 2 functional layers.

17. A coated substrate according to any of claims 1 to 16, wherein the barrier layer comprising DLC has a hydrogen content of 20% or greater.

18. A coated substrate according to any of claims 1 to 17, wherein the functional layer comprising ta-C has a hydrogen content of less than 10%.

19. The metallic substrate with a multi-layer coating according to claim 1 comprising in order:

i) a steel substrate;

ii) a seed layer having a thickness from 0.05µm to 2µm;

iii) a barrier layer deposited by a CVD method, the barrier layer comprising DLC and having a thickness of 3µm or less; and

iv) a layer comprising ta-C deposited by CVA and having a thickness of from 0.1µm to 3µm.

20. The metallic substrate with a multi-layer coating according to claim 1 comprising in order:

i) a steel substrate;

ii) a seed layer having a thickness from 0.05µm to 2µm;

iii) an intermediate layer comprising ta-C having a thickness of from 0.1µm to 1.0µm;

iv) a barrier layer deposited by a CVD method, the barrier layer comprising DLC and having a thickness of 2µm or less; and

v) a layer comprising ta-C deposited by CVA and having a thickness of from 0.1µm to 3µm.

21. A method of coating a metallic substrate, the method comprising

i) depositing onto the substrate a seed layer;

ii) depositing onto the substrate a layer of DLC having a thickness of 5µm or less via a CVD method; and

iii) depositing onto the substrate a layer of ta-C via a PVD method.