CLAIMS

WHAT IS CLAIMED IS:

1. An article comprising:

a substrate; and

a coating system on the substrate, wherein the coating system comprises:

a gamma-prime Ni_3Alfirst layer~~ comprising a gamma-prime Ni_3Al composition~~; and

a beta NiAlsecond layer directly~~comprising a beta NiAl composition~~ on the gamma-prime Ni_3Alfirst layer, wherein the gamma-prime Ni_3Alfirst layer and the beta NiAlsecond layer are discrete dual layers, and wherein the gamma-prime Ni_3Al layer is between the substrate and the beta NiAl layer.

2. The article of claim 1, wherein the gamma-prime Ni_3Al layer~~composition~~ comprises:

less than 25 atomic percent aluminum;

between 10 and 25 atomic percent of a platinum group metal; and

a balance of nickel; at least one of chromium, silicon, tantalum, or~~of~~ cobalt; a reactive element; and diffusion impurities.

3. The article of claim 2, wherein the gamma-prime Ni_3Al layer~~composition~~ comprises up to 5 at. % silicon.

4. The article of claim 2 or 3, wherein the gamma-prime Ni_3Al layer~~composition~~ comprises up to 2 at. % of the reactive element.

5. The article of any one of claims 2 to 4, wherein the reactive element comprises hafnium, yttrium, zirconium, lanthanum, or cerium.

6. The article of any one of claims 1 to 5, wherein the beta NiAl layer~~composition~~ comprises:

between 25 and 55 atomic percent aluminum;

between 10 and 25 atomic percent of a platinum group metal; and

a balance of nickel; at least one of chromium, silicon, tantalum, or cobalt; a reactive element; and diffusion impurities.

7. The article of claim 6, wherein the beta NiAl layer~~composition~~ comprises up to 35 at. % chromium.

8. The article of claim 6 or 7, wherein the beta NiAl layer~~composition~~ comprises up to 5 at. % silicon.

9. The article of any one of claims 6 to 8, wherein the beta NiAl layer~~composition~~ comprises up to 2 at. % of the reactive element.

10. The article of any one of claims 6 to 9, wherein the reactive element comprises hafnium, yttrium, zirconium, lanthanum, or cerium.

11. The article of any one of claims 1 to 10, further including a transition zone between the substrate and the gamma-prime Ni_3Al~~first~~ layer, wherein the transition zone includes a gamma-Ni phase and a gamma-prime Ni_3Al phase.

12. A method comprising:

positioning a substrate and a precursor in a sealed vessel, wherein the precursor comprises at least one of a solid halide or a combination of a halide activator and a donor;

vacuum purging and backfilling the sealed vessel;

heating the substrate and the precursor in the sealed vessel to generate a coating gas from the precursor; and

reacting the coating gas with the substrate to form a discrete dual layer~~region~~ coating including a gamma-prime Ni_3Al~~first~~ layer ~~of gamma-prime Ni_3Al on the substrate~~ and a beta NiAl~~second~~ layer directly~~of beta NiAl~~ on the gamma-prime Ni_3Al~~first~~ layer.

13. The method of claim 12, wherein the gamma-prime Ni_3Al~~first~~ layer ~~of gamma-prime Ni_3Al~~ includes:

less than about 25 atomic percent aluminum;

between about 10 and about 25 atomic percent of a platinum group metal; and

a balance of nickel; at least one of chromium, silicon, tantalum, or cobalt; a reactive element; and diffusion impurities.

14. The method of claim 12 or 13, wherein the beta NiAl~~second~~ layer ~~of beta NiAl~~ includes:

between about 25 and about 55 atomic percent aluminum;

between about 10 and about 25 atomic percent of a platinum group metal; and

a balance of nickel; at least one of chromium, silicon, tantalum, or cobalt; a reactive element; and diffusion impurities.

15. The method of any one of claims 12 to 14, further comprising electroplating a platinum group metal on the substrate, and wherein forming the discrete dual layer~~region~~ coating comprises forming a platinum group metal modified gamma-prime Ni_3Al layer on the substrate~~and beta NiAl discrete dual region coating system~~.