What is claimed is:

1. A method of forming germanium stressor layers on a substrate, comprising:

positioning the substrate in a processing chamber;

flowing a germanium precursor into the processing chamber;

forming a metal halide stressor precursor in a reaction volume coupled to the processing chamber;

flowing the stressor precursor into the processing chamber; and

growing the germanium stressor layer epitaxially on the substrate.

2. The method of claim 1, further comprising flowing a selectivity control species into the chamber.

3. The method of claim 2, wherein the substrate comprises dielectric regions and semiconductive regions, and the selectivity control species controls relative growth rate of the germanium stressor layer on the dielectric and semiconductive regions.

4. The method of claim 1, wherein forming the stressor precursor comprises flowing a halogen-containing carrier gas over a solid metal material.

5. The method of claim 1, wherein the stressor precursor comprises organotin chlorides having the general formula R_xSnCl_y, wherein R is methyl or t-butyl, x is 1 or 2, and y is 2 or 3, and the stressor precursor is sublimed from anhydrous solid crystals into a carrier gas stream comprising N_2, H_2, Ar, or He.

6. The method of claim 1, wherein the germanium precursor is germane or digermane, and the stressor precursor is an organotin chloride.

7. The method of claim 1, wherein the germanium precursor and the stressor precursor are flowed across the chamber from one side of the chamber to an opposite side of the chamber.

8. The method of claim 1, wherein the germanium precursor and the stressor precursor are flowed into the chamber through a showerhead.

9. The method of claim 3, wherein the selectivity control species selectively removes material deposited on the dielectric regions of the substrate.

10. The method of claim 2, wherein the growing the germanium stressor layer epitaxially on the substrate comprises maintaining the processing chamber at a pressure between about 5 Torr and about 80 Torr and a temperature between about 150°C and about 400°C.

11. The method of claim 10, wherein a flow rate ratio of the stressor precursor to the selectivity control species is between about 2:1 and about 100:1.

12. An apparatus for forming a stressor layer on a substrate, comprising:

a rotating substrate support disposed in an enclosure;

a plurality of gas inlets formed in a wall of the enclosure;

a least one gas outlet formed in a wall of the enclosure;

a reactive precursor generator coupled to a gas inlet by a first conduit;

a non-reactive precursor source coupled to a gas inlet by a second conduit; and

a heated exhaust system comprising a condensation trap.

13. The apparatus of claim 12, wherein at least one gas inlet is formed in a wall of the enclosure near the substrate support and the reactive source is coupled to a halide source.

14. The apparatus of claim 12, wherein the heated exhaust system comprises jacketed piping and valves and an adhesion reducing coating.

15. The apparatus of claim 14, wherein the heated exhaust system further comprises a vacuum pump, and the jacketed piping and valves end at an inlet of the vacuum pump.

16. An apparatus for forming a stressor layer on a substrate, comprising:

a rotating substrate support disposed in an enclosure;

a heat source disposed in the enclosure below the substrate support;

a gas inlet formed in a side wall of the enclosure proximate to an edge of the substrate support and having a flow direction substantially parallel to an upper surface of the substrate support;

a gas outlet formed in a side wall opposite the gas inlet and proximate to the edge of the substrate support;

a first precursor pathway coupled to the gas inlet and to a germanium hydride source;

a second precursor pathway coupled to the gas inlet and to a metal halide or organometal halide source; and

an exhaust system comprising jacketed piping and valves coupling the gas outlet to a vacuum pump.

What is claimed is:

1. A method of forming germanium stressor layers on a substrate, comprising:

positioning the substrate in a processing chamber;

flowing a germanium precursor into the processing chamber;

forming a metal halide stressor precursor in a reaction volume coupled to the processing chamber;

flowing the stressor precursor into the processing chamber; and

growing the germanium stressor layer epitaxially on the substrate.

2. The method of claim 1, further comprising flowing a selectivity control species into the chamber.

3. The method of claim 2, wherein the substrate comprises dielectric regions and semiconductive regions, and the selectivity control species controls relative growth rate of the germanium stressor layer on the dielectric and semiconductive regions.

4. The method of claim 1, wherein forming the stressor precursor comprises flowing a halogen-containing carrier gas over a solid metal material.

5. The method of claim 1, wherein the stressor precursor comprises organotin chlorides having the general formula R_xSnCl_y, wherein R is methyl or t-butyl, x is 1 or 2, and y is 2 or 3, and the stressor precursor is sublimed from anhydrous solid crystals into a carrier gas stream comprising N_2, H_2, Ar, or He.

6. The method of claim 1, wherein the germanium precursor is germane or digermane, and the stressor precursor is an organotin chloride.

7. The method of claim 1, wherein the germanium precursor and the stressor precursor are flowed across the chamber from one side of the chamber to an opposite side of the chamber.

8. The method of claim 1, wherein the germanium precursor and the stressor precursor are flowed into the chamber through a showerhead.

9. The method of claim 3, wherein the selectivity control species selectively removes material deposited on the dielectric regions of the substrate.

10. The method of claim 2, wherein the growing the germanium stressor layer epitaxially on the substrate comprises maintaining the processing chamber at a pressure between about 5 Torr and about 80 Torr and a temperature between about 150°C and about 400°C.

11. The method of claim 10, wherein a flow rate ratio of the stressor precursor to the selectivity control species is between about 2:1 and about 100:1.

12. An apparatus for forming a stressor layer on a substrate, comprising:

a rotatable substrate support disposed in an enclosure;
a plurality of gas inlets formed in a wall of the enclosure;
a least one gas outlet formed in a wall of the enclosure;
a reactive precursor generator coupled to a gas inlet by a first conduit;
a non-reactive precursor source coupled to a gas inlet by a second conduit; and
a heated exhaust system comprising a condensation trap.

13. The apparatus of claim 12, wherein at least one gas inlet is formed in a wall of the enclosure near the substrate support and the reactive source is coupled to a halide source.

14. The apparatus of claim 12, wherein the heated exhaust system comprises jacketed piping and valves and an adhesion reducing coating.

15. The apparatus of claim 14, wherein the heated exhaust system further comprises a vacuum pump, and the jacketed piping and valves end at an inlet of the vacuum pump.

16. An apparatus for forming a stressor layer on a substrate, comprising:

a rotatable substrate support disposed in an enclosure;

a heat source disposed in the enclosure below the substrate support;

a gas inlet formed in a side wall of the enclosure proximate to an edge of the substrate support and having a flow direction substantially parallel to an upper surface of the substrate support;

a gas outlet formed in a side wall opposite the gas inlet and proximate to the edge of the substrate support;

a first precursor pathway coupled to the gas inlet and to a germanium hydride source;

a second precursor pathway coupled to the gas inlet and to a metal halide or organometal halide source; and

an exhaust system comprising jacketed piping and valves coupling the gas outlet to a vacuum pump.