

What is claimed is:

1. A solid compound consisting essentially of the chemical elements of boron, silicon, hydrogen and optionally oxygen wherein boron is present at a higher atomic concentration than the other elements as measured by XPS.
2. The compound of Claim 1 having stoichiometric composition of:  $(B_{12}H_w)_xSi_yO_z$  wherein  $3 \leq w \leq 5$ ,  $2 \leq x \leq 4$ ,  $2 \leq y \leq 5$  and  $0 \leq z \leq 3$ .
3. The compound of Claim 1 wherein  $w = 4$ ,  $x = 3$ ,  $y = 5$  and  $z = 0$ .
4. The compound of Claim 2 wherein  $w = 4$ ,  $x = 2$ ,  $y = 4$  and  $z = 2$ .
5. The compound of Claim 1 and further comprising a trace significant impurity of a coinage metal.
6. The compound of Claim 1 and further comprising a trace significant impurity of gold.
7. The compound of Claims 1-6 wherein the atomic concentration of boron is from about 63% to about 89% as measured by XPS.
8. A solid compound having stoichiometric composition of:  $(B_{12}H_w)_xSi_yO_z$  wherein  $3 \leq w \leq 5$ ,  $2 \leq x \leq 4$ ,  $2 \leq y \leq 5$  and  $0 \leq z \leq 3$ .
9. The compound of Claim 8 wherein  $w = 4$ ,  $x = 3$ ,  $y = 5$  and  $z = 0$ .
10. The compound of Claim 8 wherein  $w = 4$ ,  $x = 2$ ,  $y = 4$  and  $z = 2$ .
11. The compound of Claim 8 wherein the atomic concentration of boron is from about 63% to about 89% as measured by XPS.
12. A composition of matter wherein the compound of Claim 8 is formed on a substrate comprising monocrystalline silicon.

**13.** A solid compound formed by chemical vapor deposition consisting essentially of boron, silicon, oxygen and hydrogen.

**14.** The compound of Claim **13** wherein boron is present in a higher atomic concentration than the other elements as measured by XPS.

**15.** The compound of Claim **13** wherein said chemical vapor deposition is performed at temperatures of from about 200 to about 350 degrees C and pressures from about 1 to about 30 torr.

**16.** The compound of Claim **13** wherein said chemical deposition is performed on a substrate.

**17.** The compound of Claim **16** wherein said substrate is monocrystalline silicon.

**18.** A solid compound formed by self-assembly comprising boron and silicon wherein boron is present in a higher atomic concentration than the other elements as measured by XPS.

**19.** The compound of Claim **18** wherein said boron is present in substantially icosahedron form.

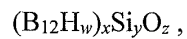
**20.** The compound of Claim **18** and further comprising a trace significant impurity of gold.

**21.** A product formed by the process of:

- a) heating a substrate to a temperature of from about 200 to about 350 degrees C in a vacuum chamber,
- b) introducing into said chamber gases comprising the elements of boron, hydrogen, and silicon; and
- c) forming a film on said substrate from such gases.

22. The product of Claim 21 wherein said vacuum chamber is maintained at a pressure between about 1 torr and about 30 torr.
23. The product of Claim 21 wherein said temperature is kept below about 300 degrees C.
24. The product formed by the process of Claim 21 wherein the process comprises the additional use of a gas comprising gold.
25. The product formed by the process of Claim 24 wherein said gold is introduced via a mixture of hydrogen and dimethyl gold (III) acetate ((CH<sub>3</sub>)<sub>2</sub> Au(OAc)).
26. The product formed by the process of Claim 25 using a metal organic chemical vapor deposition chamber.
27. The product formed by the process of Claim 25 using a rapid-thermal chemical deposition chamber.
28. The product formed by the process of Claim 21 wherein said gases are selected from the group consisting of nitrous oxide (N<sub>2</sub>O), diborane (B<sub>2</sub>H<sub>6</sub>), monosilane (SiH<sub>4</sub>) and hydrogen gas (H<sub>2</sub>).
29. The product formed by the process of Claim 21 wherein the resulting film has a relative boron atomic concentration of about 80% as measured by XPS.
30. The product formed by the process of Claim 21 wherein said substrate comprises monocrystalline silicon.
31. A method of making a composition of matter, comprising:
- a) providing a substrate in an enclosed chamber;

- b) controllably introducing into the chamber a gas mixture comprising hydrogen, boron and silicon;
- c) heating the substrate to a temperature in the range of from about 200 to about 350 degrees C to form a composition on said substrate, said composition having the formula:



where:  $3 \leq w \leq 5$ ,  $2 \leq x \leq 4$ ,  $2 \leq y \leq 5$  and  $0 \leq z \leq 3$ .

- 32. The method of Claim 31 and further introducing a gas containing gold.
- 33. The method of Claim 31 wherein said substrate is silicon.
- 34. The method of Claim 31 and further comprising the step of minimizing hydration by isolating the enclosed chamber from ambient moisture.
- 35. The method of Claim 31 wherein said composition is formed as an epitaxial layer on said substrate.
- 36. A method for forming a boron based composition with oxygen enriched regions comprising:
  - a) providing a substrate in an enclosed chamber;
  - b) heating the substrate to temperatures in the range of from about 200 to about 350° C;
  - c) controllably introducing into the chamber a gas mixture comprising hydrogen, boron, silicon and optionally oxygen;

- d) controllably varying the oxygen gas introduction over time to form a composition having regions substantially devoid of oxygen and regions with oxygen content.

37. The method of Claim 36 wherein the boron based composition has regions with and without oxygen all within the range of the formula:

- a)  $(B_{12}H_w)_xSi_yO_z$ , wherein:  $3 \leq w \leq 5$ ,  $2 \leq x \leq 4$ ,  $2 \leq y \leq 5$  and  $0 \leq z \leq 3$ .

38. The method of Claim 37 wherein the composition is formed as a layered film comprising a first layer substantially devoid of oxygen and a second layer with oxygen content.

39. A solid compound comprising boron as the majority chemical element, hydrogen as a minority chemical element, and having:

- a) no sharp x-ray diffraction peak for a diffraction angle  $2\theta$  when said compound is subjected to  $\omega$ - $2\theta$  x-ray diffraction, wherein the x-ray angle of incidence  $\omega$  is maintained at half of the diffraction angle  $2\theta$ , which is varied over  $7^\circ \leq 2\theta \leq 80^\circ$ ; and
- b) one broad x-ray diffraction peak within the range of diffraction angles  $32^\circ < 2\theta < 36^\circ$  when said compound is subjected to  $\omega$ - $2\theta$  x-ray diffraction, wherein the x-ray angle of incidence  $\omega$  is maintained at half of the diffraction angle  $2\theta$ , which is varied over  $7^\circ \leq 2\theta \leq 80^\circ$ .
- c) one broad x-ray diffraction peak at a diffraction angle  $2\theta$  contained in  $12^\circ < 2\theta < 16^\circ$  when said compound is subjected to  $\omega$ - $2\theta$  x-ray diffraction, wherein the x-ray angle of incidence  $\omega$  is maintained at half of the diffraction angle  $2\theta$ , which is varied over  $7^\circ \leq 2\theta \leq 80^\circ$ ; and

- d) a sharp x-ray diffraction peak for a fixed x-ray angle of incidence  $\omega$  that corresponds to half of a diffraction angle  $2\theta$  in the range  $12^\circ < 2\theta < 16^\circ$  when said compound is subjected to grazing-incidence x-ray diffraction, wherein the x-ray angle of incidence is fixed at an angle  $\omega \leq 8^\circ$  and the diffraction angle is varied over the range  $7^\circ \leq 2\theta \leq 80^\circ$ .

40. The compound of Claim 39 specifically having stoichiometric composition of  $(B_{12}H_w)_xSi_yO_z$  with  $0 \leq w \leq 5$ ,  $2 \leq x \leq 4$ ,  $2 \leq y \leq 5$  and  $0 \leq z \leq 3$ .

41. The compound of Claim 39 wherein an isotopic enrichment exists such that the ratio of boron  $^{11}_5B$  to boron  $^{10}_5B$  is lower than the naturally-occurring ratio.