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What is Claimed is:

1. A layered structure comprising:
a substrate;
a buffer layer formed over the substrate;
5 and
an optoelectronic device formed over the
buffer layer, wherein:
the optoelectronic device is a
metamorphic-epitaxy-formed, Sb-based optoelectronic
10 device; and
the buffer layer provides a
transition in lattice constant between the substrate and
the optoelectronic device.
2. The layered structure of claim 1, wherein
15 the buffer layer is an epitaxially formed buffer layer
directly over the substrate.
3. The layered structure of claim 1, wherein
the buffer layer comprises more than one layer.
4. The layered structure of claim 3, wherein
20 each of the more than one layer is an epitaxially grown
layer.
5. The layered structure of claim 3, wherein
the buffer layer comprises:
a Ge-based layer formed over the
25 substrate, wherein the substrate comprises a silicon-
based substrate;
a III-As layer formed over the Ge-based
layer; and

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a III-Sb layer metamorphic-epitaxy-formed over the III-As layer.

6. The layered structure of claim 5, wherein the buffer layer comprises:

5 the Ge-based layer formed directly over the substrate, wherein the substrate comprises a silicon-based substrate;

the III-As layer formed directly over the Ge-based layer; and

10 the III-Sb layer formed directly over the III-As layer.

7. The layered structure of claim 1, wherein the substrate comprises a silicon wafer having a crystallographic orientation.

15 8. The layered structure of claim 7, wherein the crystallographic orientation is a (100) surface miscut towards the <111> orientation.

9. The layered structure of claim 1, wherein the substrate comprises a complementary-metal-oxide-semiconductor (CMOS) compatible circuit, and wherein the optoelectronic device comprises an infrared photodetector electrically coupled to the CMOS compatible circuit.

10. The layered structure of claim 1, wherein the optoelectronic device comprises an alloy comprising a group-V element and a group-III element.

11. The layered structure of claim 1, wherein the optoelectronic device comprises a material of the group consisting of $\text{InAs}_z\text{Sb}_{1-z}$, $\text{AlAs}_z\text{Sb}_{1-z}$, and $\text{GaAs}_z\text{Sb}_{1-z}$, wherein z is in the range of 0 to 1.

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12. The layered structure of claim 1, wherein the optoelectronic device comprises a material of the group consisting of $\text{In}_x\text{Al}_y\text{Ga}_{1-x-y}\text{As}_z\text{Sb}_{1-z}$ wherein x , y , $x+y$, and z are in the range of 0 to 1.

5 13. The layered structure of claim 1, wherein the optoelectronic device comprises an infrared photodetector, and wherein the buffer layer provides the transition in lattice constant between the substrate and an Sb-based absorber layer of the infrared photodetector.

10 14. A method for making a layered structure, the method comprising:
 forming a buffer layer over a substrate;
and
 forming, by metamorphic-epitaxy, an
15 optoelectronic device over the buffer layer, wherein:
 the optoelectronic device is an Sb-based optoelectronic device; and
 the buffer layer provides a transition in lattice constant between the substrate and the
20 optoelectronic device.

 15. The method of claim 14, wherein forming the buffer layer comprises:
 forming a Ge-based layer over the substrate, wherein the substrate comprises a silicon-
25 based substrate;
 forming a III-As layer over the Ge-based layer; and
 forming a III-Sb layer over the III-As layer.

30 16. The method of claim 15, wherein forming the Ge-based layer comprises using chemical vapor deposition (CVD).

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17. The method of claim 15, wherein forming the III-As layer comprises using molecular beam epitaxy (MBE).

18. The method of claim 15, wherein forming
5 the III-Sb layer comprises using MBE.

19. The method of claim 15, wherein forming the optoelectronic device comprises using MBE.

20. The method of claim 15, wherein forming the Ge-based layer over the substrate comprises forming a
10 Ge-Si substrate in a first reaction process, and wherein forming a III-As layer over the Ge-based layer comprises forming the III-As layer over the Ge-Si substrate in a second reaction process.