CLAIMS

What is claimed is:

1. A power converter, comprising:

one or more GaInNAsSb junctions;

a first semiconductor layer overlying the one or more GaInNAsSb junctions; and

a second semiconductor layer underlying the one or more GaInNAsSb junctions;

wherein a thickness of the one or more GaInNAsSb junctions, the first semiconductor layer and the second semiconductor layer are selected to provide a resonant cavity at an irradiated wavelength.

2. The power converter of claim 1, wherein each of the one or more GaInNAsSb junctions,

is lattice matched to GaAs;

comprises $Ga_{1-x}In_xN_yAs_{1-y-z}Sb_z$, in which values for x, y, and z are $0 \leq x \leq 0.24$, $0.01 \leq y \leq 0.07$ and $0.001 \leq z \leq 0.20$; and

is characterized by a bandgap corresponding to the energy of the irradiated wavelength.

3. The power converter of claim 1, wherein the wavelength is from 1.3 microns to 1.55 microns.

4. The power converter of claim 1, wherein the wavelength is 1.30 microns to 1.35 microns.

5. The power converter of claim 1, comprising:

a first distributed Bragg reflector overlying the first semiconductor layer;

a second distributed Bragg reflector underlying the second semiconductor layer; or

a first distributed Bragg reflector overlying the first semiconductor layer and a second distributed Bragg reflector underlying the second semiconductor layer.

6. The power converter of claim 1, comprising:

a first distributed Bragg reflector overlying the first semiconductor layer;
a second distributed Bragg reflector underlying the second semiconductor layer; and
a substrate underlying the second distributed Bragg reflector.

7. The power converter of claim 1, comprising:
a second distributed Bragg reflector underlying the second semiconductor layer; and
a substrate underlying the second distributed Bragg reflector.

8. The power converter of claim 7, comprising an antireflection coating overlying the first semiconductor layer.

9. The power converter of claim 1, comprising:
a first distributed Bragg reflector overlying the first semiconductor layer; and
a back mirror underlying the second semiconductor layer.

10. The power converter of claim 1, comprising:
a second distributed Bragg reflector underlying the second semiconductor layer; and
a back mirror underlying the second distributed Bragg reflector.

11. The power converter of claim 1, comprising:
a first distributed Bragg reflector overlying the first semiconductor layer;
a second distributed Bragg reflector underlying the second semiconductor layer; and
a substrate overlying the first distributed Bragg reflector.

12. The power converter of claim 1, comprising:
a first distributed Bragg reflector overlying the first semiconductor layer;
a substrate overlying the first distributed Bragg reflector; and
a back mirror underlying the second semiconductor layer.

13. The power converter of claim 1, comprising:
a first lateral conductive layer overlying the first semiconductor layer; and
a second lateral conductive layer overlying the second semiconductor layer.

14. The power converter of claim 13, comprising:

a first electrical contact to the first lateral conductive layer overlying the first semiconductor layer; and

a second electrical contact to the second lateral conductive layer overlying the second semiconductor layer.

15. The power converter of claim 1, characterized by an efficiency of at least 20% at an irradiated input power from 0.6 W to 6 W.

16. A power converter, comprising a plurality of the power converters of claim 1 configured in a Pi structure.

17. A power converter, comprising a plurality of the power converters of claim 1 interconnected in series.

CLAIMS

1. A resonant cavity power converter, comprising:

one or more GaInNAsSb junctions;

a first semiconductor layer overlying the one or more GaInNAsSb junctions; and

a second semiconductor layer underlying the one or more GaInNAsSb junctions;

wherein a thickness of the one or more GaInNAsSb junctions, the first semiconductor layer and the second semiconductor layer are selected to provide a resonant cavity at an irradiated wavelength.

2. The resonant cavity power converter of claim 1, wherein each of the one or more GaInNAsSb junctions,

is lattice matched to GaAs;

comprises $Ga_{1-x}In_xN_yAs_{1-y-z}Sb_z$, in which values for x, y, and z are $0 \leq x \leq 0.24$, $0.01 \leq y \leq 0.07$ and $0.001 \leq z \leq 0.20$; and

is characterized by a bandgap corresponding to the energy of the irradiated wavelength.

3. The resonant cavity power converter of claim 1 or claim 2, wherein the wavelength is from 1.3 microns to 1.55 microns.

4. The resonant cavity power converter of claim 1 or claim 2, wherein the wavelength is 1.30 microns to 1.35 microns.

5. The resonant cavity power converter of any one of the preceding claims, comprising:

a first distributed Bragg reflector overlying the first semiconductor layer;

a second distributed Bragg reflector underlying the second semiconductor layer; or

a first distributed Bragg reflector overlying the first semiconductor layer and a second distributed Bragg reflector underlying the second semiconductor layer.

6. The resonant cavity power converter of any one of claims 1 to 4, comprising:
a first distributed Bragg reflector overlying the first semiconductor layer;
a second distributed Bragg reflector underlying the second semiconductor layer; and
a substrate underlying the second distributed Bragg reflector.

7. The resonant cavity power converter of any one of claims 1 to 4, comprising:
a second distributed Bragg reflector underlying the second semiconductor layer; and
a substrate underlying the second distributed Bragg reflector.

8. The resonant cavity power converter of claim 7, comprising an antireflection coating overlying the first semiconductor layer.

9. The resonant cavity power converter of any one of claims 1 to 4, comprising:
a first distributed Bragg reflector overlying the first semiconductor layer; and
a back mirror underlying the second semiconductor layer.

10. The resonant cavity power converter of any one of claims 1 to 4, comprising:
a second distributed Bragg reflector underlying the second semiconductor layer; and
a back mirror underlying the second distributed Bragg reflector.

11. The resonant cavity power converter of any one of claims 1 to 4, comprising:
a first distributed Bragg reflector overlying the first semiconductor layer;
a second distributed Bragg reflector underlying the second semiconductor layer; and
a substrate overlying the first distributed Bragg reflector.

12. The resonant cavity power converter of any one of claims 1 to 4, comprising:
a first distributed Bragg reflector overlying the first semiconductor layer;
a substrate overlying the first distributed Bragg reflector; and
a back mirror underlying the second semiconductor layer.

13. The resonant cavity power converter of any one of the preceding claims, comprising:

a first lateral conductive layer overlying the first semiconductor layer; and

a second lateral conductive layer overlying the second semiconductor layer.

14. The resonant cavity power converter of claim 13, comprising:

a first electrical contact to the first lateral conductive layer overlying the first semiconductor layer; and

a second electrical contact to the second lateral conductive layer overlying the second semiconductor layer.

15. The resonant cavity power converter of any one of the preceding claims, characterized by an efficiency of at least 20% at an irradiated input power from 0.6 W to 6 W.

16. A resonant cavity power converter, comprising a plurality of the resonant cavity power converters of any one of the preceding claims configured in a Pi structure.

17. A resonant cavity power converter, comprising a plurality of the resonant cavity power converters of any one of the preceding claims interconnected in series.