CLAIMS

What is claimed as new and desired to be protected by Letters Patent of the United States is:

1. A method for fabricating an integrated structure, the method comprising:

   forming a first semiconductor material over a fabricated CMOS structure containing an electronic device;

   fabricating a photonic device in association with the first semiconductor material, the photonic device having associated doped regions; and

   activating the doped regions with microwave energy such that the doped regions are heated to a temperature in the range of about 200 to about 500 degrees Celsius .

2. The method according to claim 1, wherein the doped regions are heated to a temperature within the range of about 300 to about 400 degrees Celsius.

3. The method according to claim 1, wherein the first semiconductor material is thicker than a second semiconductor material in which the electronic device of the CMOS structure is formed.

4. The method according to claim 3, further comprising forming a buried oxide material adjacent to the first semiconductor material.

5. The method according to claim 4, wherein the buried oxide material has a thickness greater than or equal to 1 micrometer and the first semiconductor material has a thickness greater than or equal to 200 nanometers.

6. The method according to claim 1, wherein the photonic device comprises a photodetector.

7. The method according to claim 1, wherein the photonic device is device selected from a group consisting of a waveguide, a modulator, a demodulator, and a photodetector.

8. The method according to claim 1, wherein the dopant is heated with microwave energy for at least about five minutes.

9. The method according to claim 8, wherein the dopant is heated with microwave energy for up to about two hours.

10. The method according to claim 1, wherein the activating step occurs using microwave at a frequency greater than or equal to about 1.5 Ghz and less than or equal to about 8.5 GHz.

11. The method according to claim 1, wherein the activating step occurs using microwaves at a frequency of about 2.45 GHz and at a power of about 1300 W.

12. The method according to claim 1, further comprising:

forming a waveguide in the first semiconductor material and a photodetector material in association with the waveguide.

13. The method according to claim 12, wherein the activating occurs before forming the photodetector material.

14. The method according to claim 12, wherein the activating occurs after forming the photodetector material.

15. The method according to claim 13, wherein the photodetector material comprises one of germanium and silicon-germanium.

16. The method according to claim 1, further comprising forming an electrical connection between a metallization material and the photonic device.

17. The method according to claim 16, further comprising forming an electrical connection between a metallization material associated with an electronic device in the CMOS structure and a metallization material associated with the photonic device.

18. A semiconductor structure, comprising:

at least one electronic device fabricated on a first semiconductor structure; and

at least one photonic device fabricated in a semiconductor material which is formed above the at least one electronic device, the at least one photonic device having associated microwave activated dopant implants.

19. The semiconductor structure according to claim 18, wherein the semiconductor material forms part of a silicon on insulator substrate formed over the first semiconductor substrate.

20. The semiconductor structure according to claim 18, wherein the photonic device is selected from a group consisting of a waveguide, a modulator, a demodulator and a photodetector.

21. The semiconductor structure according to claim 18, further comprising an electrical connection between the photonic device and the at least one electronic device.

CLAIMS

1. A method for fabricating an integrated structure, the method comprising:

fabricating a CMOS structure containing an electronic device over a substrate, wherein the electronic device is formed using a first semiconductor material;

fabricating a second semiconductor material over the fabricated CMOS structure containing the electronic device such that the electronic device is formed between the first semiconductor material and the second semiconductor material;

fabricating a photonic device using the second semiconductor material, the photonic device having associated doped regions; and

activating the doped regions with microwave energy such that the doped regions are heated to a temperature in the range of about 200 to about 500 degrees Celsius.

2. The method according to claim 1, wherein the doped regions are heated to a temperature within the range of about 300 to about 400 degrees Celsius.

3. The method according to claim 1, wherein the second semiconductor material is thicker than the first semiconductor material in which the electronic device of the CMOS structure is formed.

4. The method according to claim 3, further comprising forming a buried oxide material adjacent to the second semiconductor material.

5. The method according to claim 4, wherein the buried oxide material has a thickness greater than or equal to 1 micrometer and the second semiconductor material has a thickness greater than or equal to 200 nanometers.

6. The method according to claim 1, wherein the photonic device comprises a photodetector.

7. The method according to claim 1, wherein the photonic device is device selected from a group consisting of a waveguide, a modulator, a demodulator, and a photodetector.

8. The method according to claim 1, wherein the dopant is heated with microwave energy for at least about five minutes.

9. The method according to claim 8, wherein the dopant is heated with microwave energy for up to about two hours.

10. The method according to claim 1, wherein the activating step occurs using microwave at a frequency greater than or equal to about 1.5 Ghz and less than or equal to about 8.5 GHz.

11. The method according to claim 1, wherein the activating step occurs using microwaves at a frequency of about 2.45 GHz and at a power of about 1300 W.

12. The method according to claim 1, further comprising:

forming a waveguide in the second semiconductor material and a photodetector material in association with the waveguide.

13. The method according to claim 12, wherein the activating occurs before forming the photodetector material.

14. The method according to claim 12, wherein the activating occurs after forming the photodetector material.

15. The method according to claim 13, wherein the photodetector material comprises one of germanium and silicon-germanium.

16. The method according to claim 1, further comprising forming an electrical connection between a metallization material and the photonic device.

17. The method according to claim 16, further comprising forming an electrical connection between a metallization material associated with an electronic device in the CMOS structure and a metallization material associated with the photonic device.

18. A semiconductor structure, comprising:

at least one electronic device fabricated on a first semiconductor material; and

at least one photonic device fabricated in a second semiconductor material which is formed above the at least one electronic device, the at least one photonic device having associated microwave activated dopant implants, wherein the at least one electronic device is between the first semiconductor material and the second semiconductor material.

19. The semiconductor structure according to claim 18, wherein the semiconductor material forms part of a silicon on insulator substrate formed over the first semiconductor substrate.

20. The semiconductor structure according to claim 18, wherein the photonic device is selected from a group consisting of a waveguide, a modulator, a demodulator and a photodetector.

21. The semiconductor structure according to claim 18, further comprising an electrical connection between the photonic device and the at least one electronic device.