WHAT IS CLAIMED IS:

1. An electrical device for detecting an item of interest in a detector card, the electrical device comprising:

a detection material sensitive to exposure to the item of interest, wherein:

at least one surface of the detection material is configured to be exposed to items external to the electrical device,

an electrical characteristic of the detection material is altered after exposure to the item of interest, and

the item of interest comprises a chemical and/or biologic compound;

a semiconductor material, wherein:

the semiconductor material is adjacent to the detection material, and

the semiconductor material is configured to comprise part of a diode or a transistor; and

a plurality of electrical terminals configured to provide electrical current through at least a portion of the detection material and the semiconductor material.

2. The electrical device for detecting the item of interest recited in claim 1, wherein the semiconductor material comprises an n-type semiconductor material and a p-type semiconductor material forming a PN junction wherein:

the detection material is adjacent to the p-type semiconductor material, or

the detection material is adjacent to the n-type semiconductor material.

3. The electrical device for detecting the item of interest recited in claim 2, further comprising a substrate material between at least one electrical terminal and either the p-type semiconductor material, or the n-type semiconductor material

4. The electrical device for detecting the item of interest recited in claim 1, wherein the detection material comprises a molecularly imprinted polymer.

5. The electrical device for detecting the item of interest recited in claim 1, further comprising a conductive material, in addition to the detection material, wherein the

plurality of electrical terminals provide electrical current through at least a portion of the conductive material.

6. The electrical device for detecting the item of interest recited in claim 5, wherein the conductive material includes a conductive path that enables at least a portion of the electrical current to bypass the detection material.

7. The electrical device for detecting the item of interest recited in claim 5, wherein the conductive material includes at least one conductive material selected from the group consisting of:

a conductive polymer,

a carbon ink material, and

a silver or aluminum ink material.

8. The electrical device for detecting the item of interest recited in claim 1, further comprising a filter configured to physically block certain items from contacting the detection material.

9. A detection circuit for detecting exposure to an item of interest, the detection circuit comprising:

a first detection device having a first element sensitive to the item of interest, wherein:

the first element is configured to be exposed to items external to the first detection device,

an electrical characteristic of the first element is altered after exposure to the item of interest,

the first detection circuit can detect if the first element has been exposed to the item of interest, and

the item of interest comprises a chemical and/or biologic compound; and

a second detection device that includes a second element sensitive to the item of interest, wherein the second element sensitive to the item of interest is protected from exposure to items external to the second detection device; and

a power source electrically coupled with the first detection device.

10. The detection circuit for detecting exposure to an item of interest recited in claim 9, wherein the power source generates at least some of its power by inductive coupling.

11. The detection circuit for detecting exposure to an item of interest recited in claim 9, further comprising a comparator wherein:

an output of the first detection device is electrically coupled with a first input of the comparator;

an output of the second detection device is electrically coupled with a second input of the comparator; and

the comparator compares electrical signals of the first and second inputs and provides an electrical signal based, at least in part, on the comparison.

12. The detection circuit for detecting exposure to an item of interest recited in claim 9, wherein the first and second detection devices are nonlinear detection devices.

13. The detection circuit for detecting exposure to an item of interest recited in claim 9, wherein the item of interest is a first item of interest, further comprising a third detection device having an element sensitive to a second item of interest.

14. A method of manufacturing a device for detecting an item of interest, the method comprising:

forming, on a substrate, a region of detection material sensitive to exposure to the item of interest, wherein:

at least one surface of the detection material is configured to be exposed to items external to the electrical device,

an electrical characteristic of the detection material is altered after exposure to the item of interest, and

the item of interest comprises a chemical and/or biologic compound;

forming, on a substrate, at least one region of semiconductor material, wherein:

the semiconductor material is adjacent to the detection material, and

the semiconductor material is configured to comprise part of a diode or a transistor; and

forming, on the substrate, at least one region of conductive material electrically coupled with the detection material and the semiconductor material.

15. The method of manufacturing the device for detecting the item of interest recited in claim 14, wherein the substrate comprises at least one material selected from the group consisting of:

paper,

glass,

steel, and

plastic.

16. The method of manufacturing the device for detecting the item of interest recited in claim 14, wherein forming the region of detection material, the at least one region of conductive material, or both, comprises using one or more printing methods.

17. The method of manufacturing the device for detecting the item of interest recited in claim 14, wherein the at least one region of semiconductor material comprises an n-type semiconductor and a p-type semiconductor forming a PN junction wherein:

the region of detection material is physically adjacent to the p-type semiconductor, or

the region of detection material is physically adjacent to the n-type semiconductor.

18. The method of manufacturing the device for detecting the item of interest recited in claim 14, wherein the at least one region of semiconductor material is physically located between the substrate and the region of detection material.

19. The method of manufacturing the device for detecting the item of interest recited in claim 14, wherein the detection material comprises a molecularly imprinted polymer.

20. The method of manufacturing the device for detecting the item of interest recited in claim 14, wherein the at least one region of conductive material includes a conductive path that enables at least a portion of the electrical current to bypass the detection material.

21. The method of manufacturing the device for detecting the item of interest recited in claim 14, wherein the conductive material includes at least one conductive material selected from the group consisting of:

a conductive polymer,

a carbon ink material, and

a silver or aluminum ink material.

22. The method of manufacturing the device for detecting the item of interest recited in claim 14, further comprising forming filter above the region of detection material.

Claims

1. An electrical device for detecting exposure to an item of interest in a detector card, the electrical device comprising: a detection material sensitive to exposure to the item of interest in particulate or droplet form, wherein: at least one surface of the detection material is configured to be exposed to items external to the electrical device, an electrical characteristic of the detection material is altered after exposure to the item of interest, and the item of interest comprises a chemical and/or biologic compound; a semiconductor material, wherein: the semiconductor material is adjacent to the detection material, and the semiconductor material is configured to comprise part of a diode or a transistor; and a plurality of electrical terminals configured to provide electrical current through at least a portion of the detection material and the semiconductor material, wherein the detection material is directly electrically connected with one or more of said plurality of electrical terminals.

2. The electrical device for detecting the item of interest recited in claim 1, wherein the semiconductor material comprises an n-type semiconductor material and a p-type semiconductor material forming a PN junction wherein: the detection material is adjacent to the p-type semiconductor material, or the detection material is adjacent to the n-type semiconductor material.

3. The electrical device for detecting the item of interest recited in claim 2, further comprising a substrate material between at least one electrical terminal and either the p-type semiconductor material, or the n-type semiconductor material.

4. The electrical device for detecting the item of interest recited in claim 1, wherein the detection material comprises a molecularly imprinted polymer.

5. The electrical device for detecting the item of interest recited in claim 1, further comprising a conductive material, in addition to the detection material, wherein the plurality of electrical terminals provide electrical current through at least a portion of the conductive material.

6. The electrical device for detecting the item of interest recited in claim 5, wherein the conductive material includes a conductive path that enables at least a portion of the electrical current to bypass the detection material.

7. The electrical device for detecting the item of interest recited in claim 5, wherein the conductive material includes at least one conductive material selected from the group consisting of: a conductive polymer, a carbon ink material, and a silver or aluminum ink material.

8. The electrical device for detecting the item of interest recited in claim 1, further comprising a filter configured to physically block certain items from contacting the detection material.

9. A detection circuit for detecting exposure to an item of interest, the detection circuit comprising: a first detection device having a first element sensitive to the item of interest, wherein: the first element is configured to be exposed to items external to the first detection device, an electrical characteristic of the first element is altered after exposure to the item of interest, the first detection device can detect if the first element has been exposed to the item of interest, and the item of interest comprises a chemical and/or biologic compound; and a second detection device that includes a second element sensitive to the item of interest, wherein the second element sensitive to the item of interest is protected from exposure to items external to the second detection device; and a power source electrically coupled with the first detection device and the second detection device.

10. The detection circuit for detecting exposure to an item of interest recited in claim 9, wherein the power source generates at least some of its power by inductive coupling.

11. The detection circuit for detecting exposure to an item of interest recited in claim 9, further comprising a comparator wherein: an output of the first detection device is electrically coupled with a first input of the comparator; an output of the second detection device is electrically coupled with a second input of the comparator; and the comparator compares

electrical signals of the first and second inputs and provides an electrical signal based, at least in part, on the comparison.

12. The detection circuit for detecting exposure to an item of interest recited in claim 9, wherein the first and second detection devices are nonlinear detection devices.

13. The detection circuit for detecting exposure to an item of interest recited in claim 9, wherein the item of interest is a first item of interest, further comprising a third detection device having an element sensitive to a second item of interest.

14. A method of manufacturing a device for detecting an item of interest, the method comprising: forming, on a substrate, a region of detection material sensitive to exposure to the item of interest in particulate or droplet form, wherein: at least one surface of the detection material is configured to be exposed to items external to the device, an electrical characteristic of the detection material is altered after exposure to the item of interest, and the item of interest comprises a chemical and/or biologic compound; forming, on the substrate, at least one region of semiconductor material, wherein: the semiconductor material is adjacent to the detection material, and the semiconductor material is configured to comprise part of a diode or a transistor; and forming, on the substrate, at least one region of conductive material electrically coupled with the detection material and the semiconductor material, wherein the detection material is directly electrically connected with the at least one region of conductive material.

15. The method of manufacturing the device for detecting the item of interest recited in claim 14, wherein the substrate comprises at least one material selected from the group consisting of: paper, glass, steel, and plastic.

16. The method of manufacturing the device for detecting the item of interest recited in claim 14, wherein forming the region of detection material, the at least one region of conductive material, or both, comprises using one or more printing methods.

17. The method of manufacturing the device for detecting the item of interest recited in claim

14, wherein the at least one region of semiconductor material comprises an n-type semiconductor and a p-type semiconductor forming a PN junction wherein: the region of detection material is physically adjacent to the p-type semiconductor, or the region of detection material is physically adjacent to the n-type semiconductor.

18. The method of manufacturing the device for detecting the item of interest recited in claim 14, wherein the at least one region of semiconductor material is physically located between the substrate and the region of detection material.

19. The method of manufacturing the device for detecting the item of interest recited in claim 14, wherein the detection material comprises a molecularly imprinted polymer.

20. The method of manufacturing the device for detecting the item of interest recited in claim 14, wherein the at least one region of conductive material includes a conductive path that enables at least a portion of an electrical current to bypass the detection material.

21. The method of manufacturing the device for detecting the item of interest recited in claim 14, wherein the conductive material includes at least one conductive material selected from the group consisting of: a conductive polymer, a carbon ink material, and a silver or aluminum ink material.

22. The method of manufacturing the device for detecting the item of interest recited in claim 14, further comprising forming filter above the region of detection material.