**WHAT IS CLAIMED IS:**

1. A method for manufacturing an electric sensor, comprising:

   (a) thermal transfer printing a conductive pattern defining at least one conductive trace onto a surface of a receiving substrate; and

   (b) securing at least a portion of the receiving substrate to at least a second substrate to form an enclosure, wherein at least a portion of the conductive pattern is positioned within the enclosure,
   wherein the conductive pattern is printed with a thermal transfer printer having a printhead density of at least 300 dpi;

   wherein the conductive pattern comprises interdigitated microelectrodes having a thickness of 1 micron or less and a width of 250 microns or less; and

   wherein the sensor is a microfluidic device having the interdigitated microelectrodes within a microchannel.

2. The method of claim 1, wherein ~~the sensor is a microfluidic device and~~ the conductive pattern defines at least two electrodes positioned within ~~a~~the micro-channel of the microfluidic device.

~~3. The method of claim 1, wherein the conductive pattern has at least a portion having a thickness of 1 micron or less.~~

~~4. The method of claim 1, wherein the conductive pattern has at least one conductive trace having at least a portion having a width of 250 microns or less.~~

35. The method of claim 1, wherein the conductive pattern has at least one conductive trace having at least a portion having a width of 50 microns or less.

46. The method of one of the preceding claims, wherein the conductive pattern comprises aluminum, silver, platinum, iron, graphite, or a derivative or combination thereof.

57. The method of claim 46, wherein the conductive pattern comprises particles of aluminum, silver, platinum, iron, graphite, or a combination thereof.

68. A method for manufacturing an electric sensor, comprising:

(a) thermal transfer printing a conductive pattern defining at least one conductive trace onto a surface of a receiving substrate; and

(b) securing at least a portion of the receiving substrate to at least a second substrate to form an enclosure, wherein at least a portion of the conductive pattern is positioned within the enclosure,

wherein the conductive pattern is printed with a thermal transfer printer having a printhead density of at least 300 dpi;

wherein the sensor is a microfluidic device having interdigitated microelectrodes within a microchannel and the conductive pattern defines at least two electrodes positioned within athe micro-channel of the microfluidic device;, and

wherein the conductive pattern comprises the interdigitated microelectrodes having a thickness of 1 micron or less and a width of 250 microns or less.

79. A method for manufacturing an electric sensor, comprising:

(a) thermal transfer printing a conductive pattern defining at least one conductive trace onto a surface of a receiving substrate; and

(b) securing at least a portion of the receiving substrate to at least a second substrate to form an enclosure, wherein at least a portion of the conductive pattern is positioned within the enclosure,

wherein the conductive pattern comprises one or more conductive polymers;

wherein the conductive pattern is printed with a thermal transfer printer having a printhead density of at least 300 dpi;

wherein the conductive pattern comprises interdigitated microelectrodes having a thickness of 1 micron or less and a width of 250 microns or less; and

wherein the sensor is a microfluidic device having the interdigitated microelectrodes within a microchannel .

810. A method for manufacturing an electric sensor, comprising:

(a) thermal transfer printing a conductive pattern defining at least one conductive trace onto a surface of a receiving substrate; and

(b) securing at least a portion of the receiving substrate to at least a second substrate to form an enclosure, wherein at least a portion of the conductive pattern is positioned within the enclosure,

wherein the enclosure comprises a fluid;

wherein the conductive pattern is printed with a thermal transfer printer having a printhead density of at least 300 dpi;

wherein the conductive pattern comprises interdigitated microelectrodes having a thickness of 1 micron or less and a width of 250 microns or less; and

wherein the sensor is a microfluidic device having the interdigitated microelectrodes within a microchannel.

911. The method of claim 810, wherein the fluid comprises a reagent.

1012. The method of claim 810, wherein the fluid comprises vapor.

1113. A method for manufacturing an electric sensor, comprising:

(a) thermal transfer printing a conductive pattern defining at least one conductive trace onto a surface of a receiving substrate; and

(b) securing at least a portion of the receiving substrate to at least a second substrate to form an enclosure, wherein at least a portion of the conductive pattern is positioned within the enclosure,

wherein ~~the non-conductive surface~~ a portion of the surface of the receiving substrate comprises a biological coating,

wherein the conductive pattern is printed with a thermal transfer printer having a printhead density of at least 300 dpi;

wherein the conductive pattern comprises interdigitated microelectrodes having a thickness of 1 micron or less and a width of 250 microns or less; and

wherein the sensor is a microfluidic device having the interdigitated microelectrodes within a microchannel.

1214. An electric sensor, comprising:

(a)an enclosure; and

(b) a plurality of thermal-transfer-printed conductive traces positioned at least partially within the enclosure,

wherein the conductive traces are printed with a thermal transfer printer having a printhead density of at least 300 dpi;

wherein the conductive traces comprise interdigitated microelectrodes having a thickness of 1 micron or less and a width of 250 microns or less; and

wherein the sensor is a microfluidic device having the interdigitated microelectrodes within a microchannel.

1315. The sensor of claim 1214, wherein ~~the sensor is a microfluidic device and~~ the enclosure comprises ~~the~~a micro-channel and the plurality of conductive traces are at least partially positioned within the micro-channel.

~~16. The sensor of claim 14, wherein the conductive traces have one or more portions having a thickness of 1 micron or less.~~

1417. The sensor of claim 1214, wherein the conductive traces have one or more portions having a width of 50 ~~500~~ microns or less.

18. The sensor of claim 14, wherein the conductive traces comprises particles of aluminum, silver, platinum, iron, graphite, or a combination thereof.

1519. An electric sensor, comprising:

(a) an enclosure; and

(b) a plurality of thermal-transfer-printed conductive traces positioned at least partially within the enclosure,

wherein the plurality of thermal-transfer-printed conductive traces are printed on a biological coating;

wherein the plurality of thermal-transfer-printed conductive traces are printed with a thermal transfer printer having a printhead density of at least 300 dpi;

wherein the plurality of thermal-transfer-printed conductive traces comprise interdigitated microelectrodes having a thickness of 1 micron or less and a width of 250 microns or less; and

wherein the sensor is a microfluidic device having the interdigitated microelectrodes within a microchannel.

1620.An electric sensor, comprising:

(a) an enclosure; and

(b) a plurality of thermal-transfer-printed conductive traces positioned at least partially within the enclosure,

wherein the conductive traces have a first surface energy that is at least 5 Dynes/cm greater or lower than a surface energy of a surrounding material;

wherein the plurality of thermal-transfer-printed conductive traces are printed with a thermal transfer printer having a printhead density of at least 300 dpi;

wherein the plurality of thermal-transfer-printed conductive traces comprise interdigitated microelectrodes having a thickness of 1 micron or less and a width of 250 microns or less; and

wherein the sensor is a microfluidic device having the interdigitated microelectrodes within a microchannel.

1721.A microfluidic sensor comprising a body defining at least a first microfluidic channel, the microfluidic channel having at least one surface comprising at

least two different materials, wherein a first material has a first surface energy and a second material comprises a second surface energy that is at least 5 Dynes/cm greater than the first surface energy.

wherein the plurality of thermal-transfer-printed conductive traces comprises interdigitated microelectrodes having a thickness of 1 micron or less and a width of 250 microns or less;

wherein the plurality of thermal-transfer-printed conductive traces are printed with a thermal transfer printer having a printhead density of at least 300 dpi; and

wherein the interdigitated microelectrodes are within the microfluidic channel.

18~~22~~.The microfluidic sensor of claim 17~~21~~, wherein the second material comprises thermal transfer printed material.

19~~23~~.The microfluidic sensor of claim 17~~-21~~, wherein the second material has a surface energy of greater than 45 Dynes/cm.

20~~24~~.The microfluidic sensor of claim 19~~23~~, wherein the second material has a surface energy of greater than 60 Dynes/cm.

21~~25~~.The microfluidic sensor of claim 17~~21~~, wherein the second material comprises a conductive material.

22~~26~~.The microfluidic sensor of claim 21~~25~~, wherein one or more portions of the second material are connected to a power source to apply a potential to the second material to change wetting properties of the second material.

23~~27~~.The microfluidic sensor of claim 21~~25~~, wherein the second material comprises aluminum particles.

24~~28~~.The microfluidic sensor of one of claims 17, 19 and 20 ~~21, 23, and 24,~~ wherein the first material has a surface energy of less than 45 Dynes/cm.

25~~29~~. The microfluidic sensor of claim 24~~28~~, wherein the first material has a surface energy of less than 40 Dynes/cm.

26~~30~~.The microfluidic sensor of claim 17 ~~-21~~ or claim 23~~27~~, wherein the first material comprises pMMA.

~~31.The microfluidic sensor of one of claims 21-30, wherein the second material has a thickness of 1 micron or less~~.