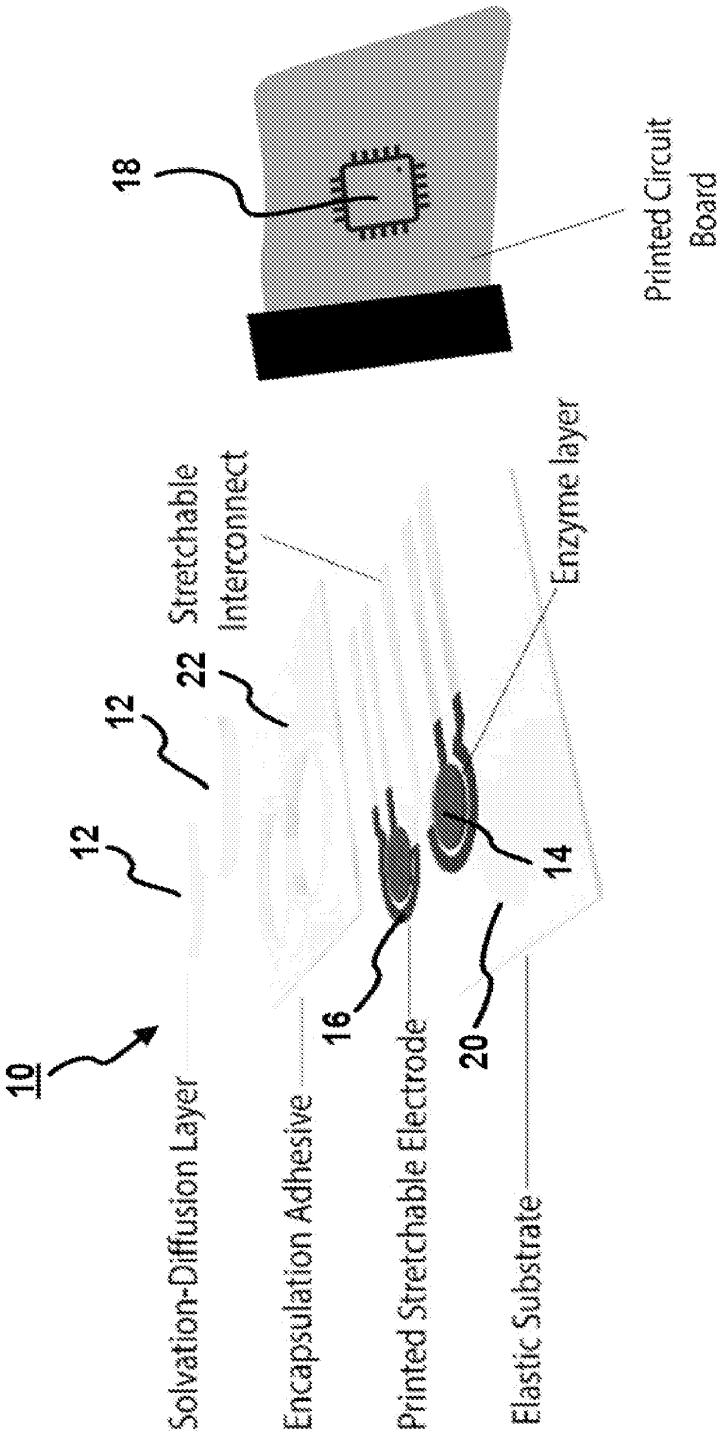
18
Printed Circuit Board
Stretchable Interconnect
22
12
12
Enzyme layer
10
Solvation-Diffusion Layer
Encapsulation Adhesive
16
Printed Stretchable Electrode
20
14
Elastic Substrate

FIG. 1

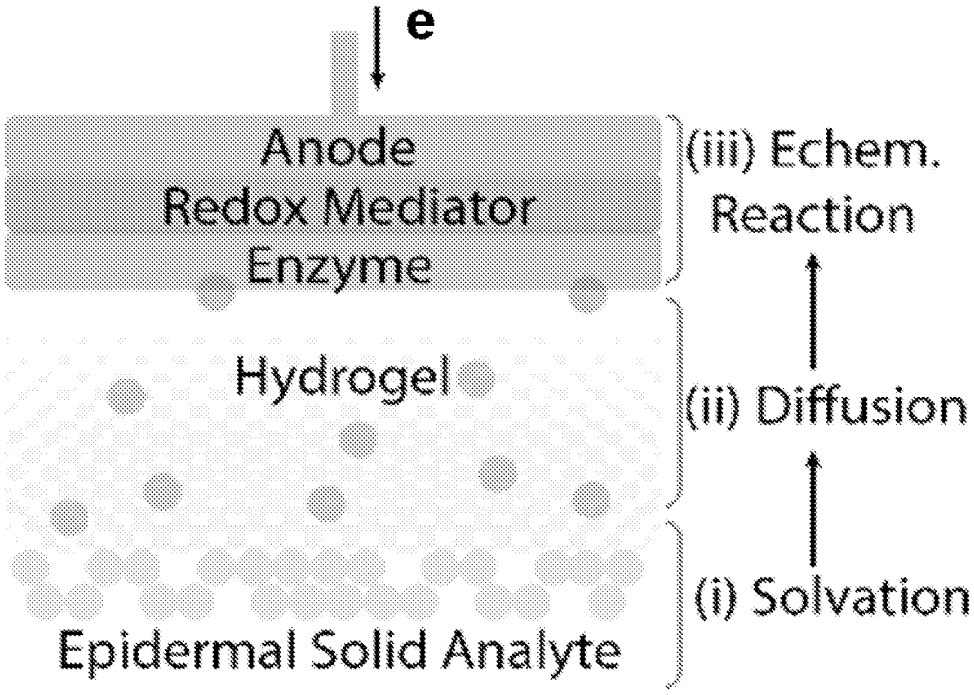
e
Anode
Redox Mediator
Enzyme
(iii) Echem. Reaction
Hydrogel
(ii) Diffusion
(i) Solvation
Epidermal Solid Analyte

FIG. 2

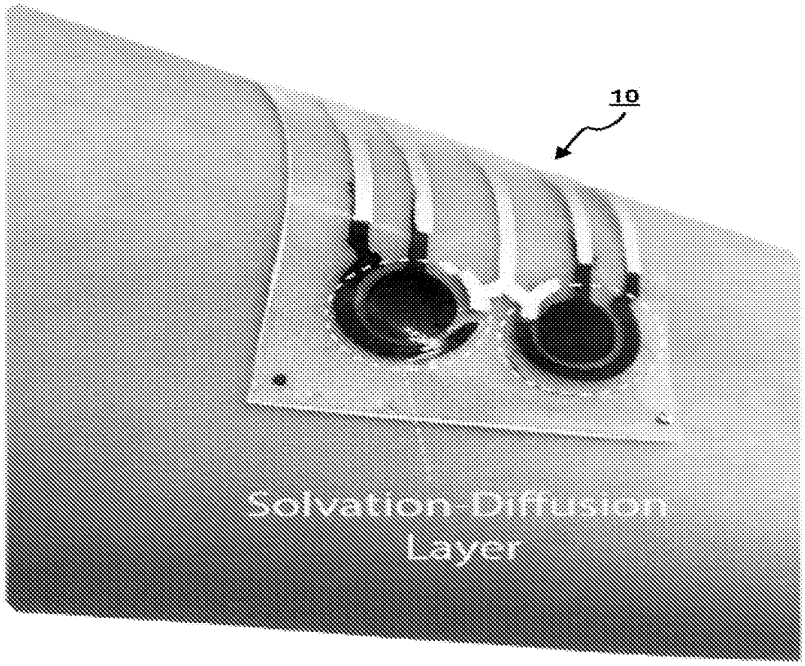
10
Solvation-Diffusion Layer

FIG. 3

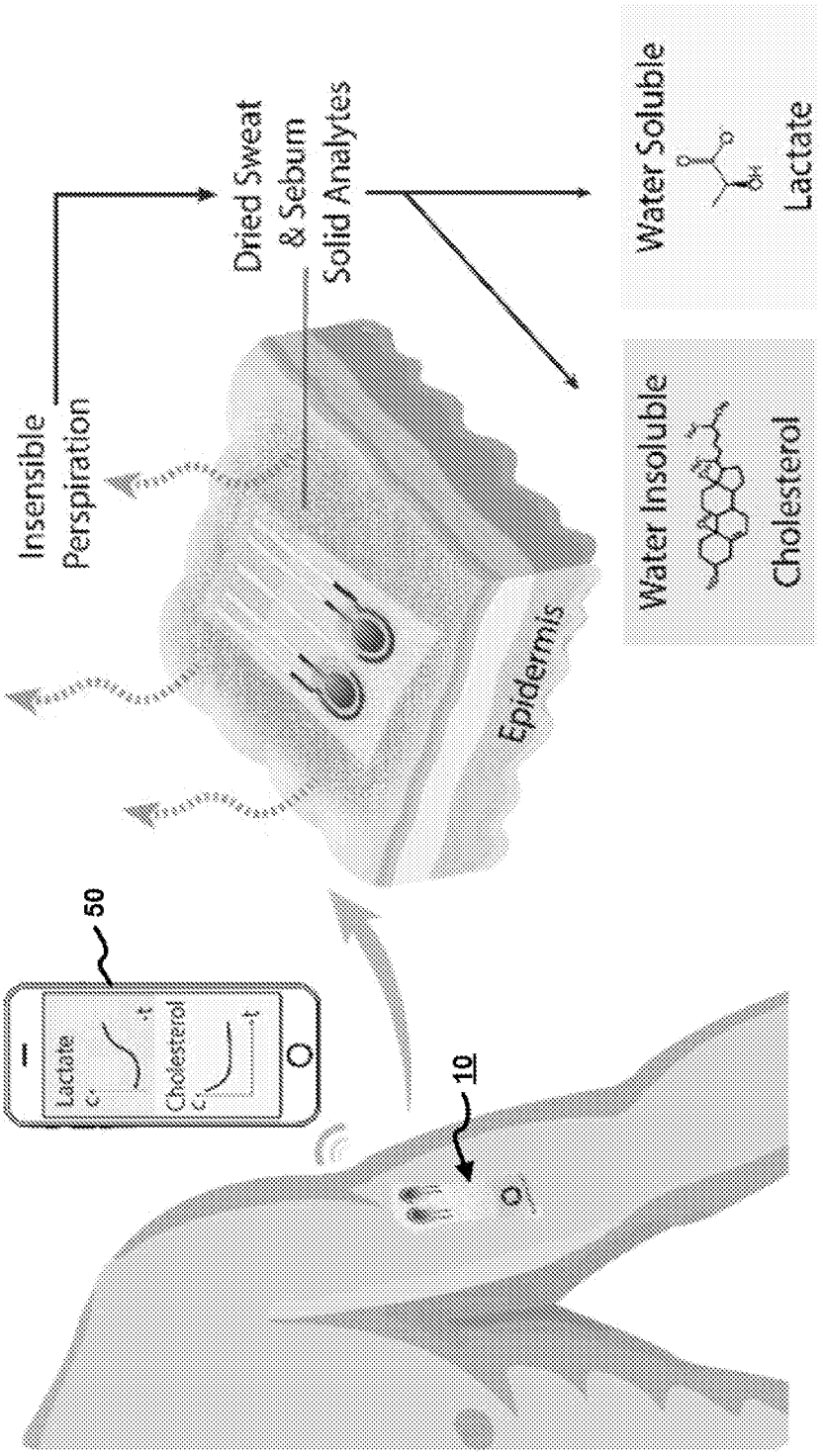
Insensible Perspiration
Dried Sweat & Sebum Solid Analytes
Water Soluble
Lactate
Water Insoluble
Cholesterol
Epidermis
50
Lactate
Cholesterol
10

FIG. 4

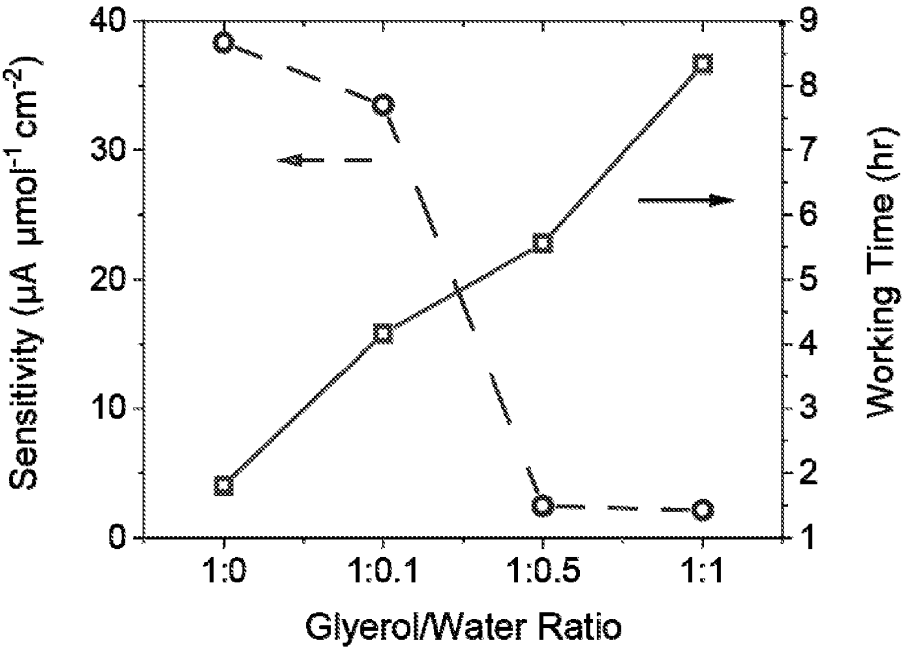
Sensitivity (μA μmol-1 cm-2)
Working Time (hr)
Glyerol/Water Ratio
1:0
1:0.1
1:0.5
1:1
0
10
20
30
40
1
2
3
4
5
6
7
8
9

FIG. 5A

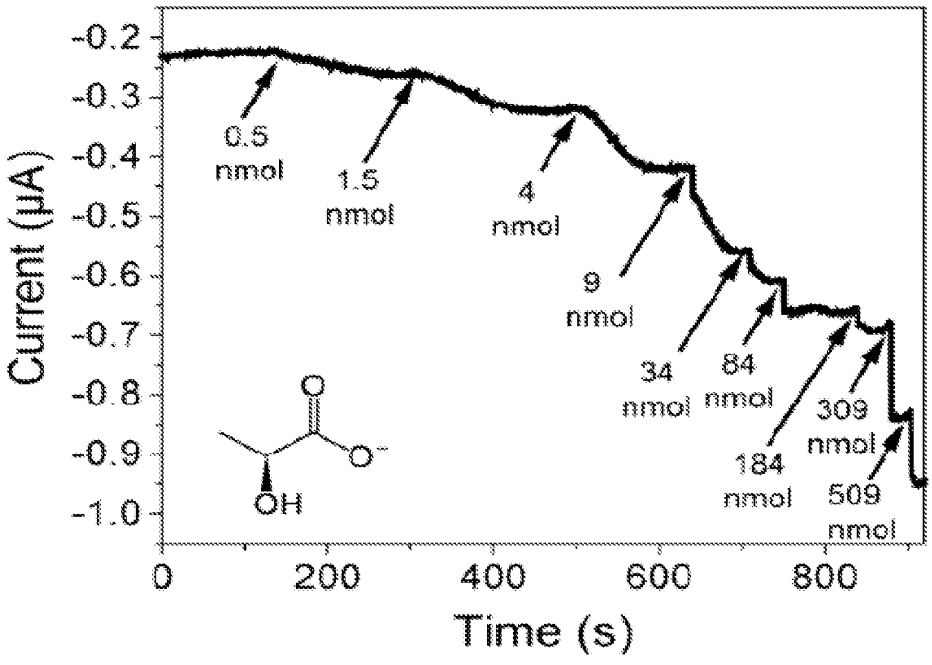
Current (μA)
Time (s)
0.5 nmol
1.5 nmol
4 nmol
9 nmol
34 nmol
84 nmol
184 nmol
309 nmol
509 nmol
OH
O
O-
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
-0.9
-1.0
0
200
400
600
800

FIG. 5B

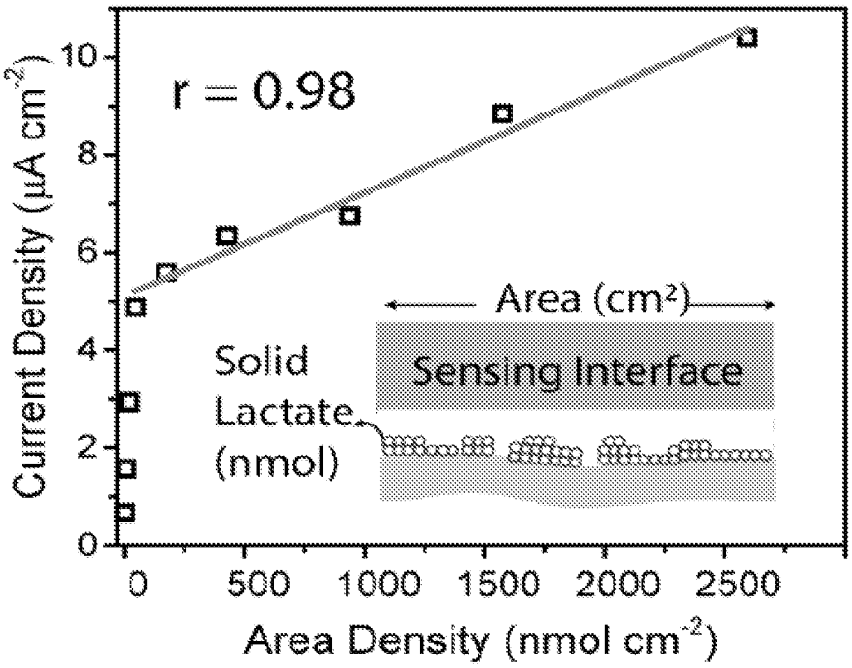
r = 0.98
Current Density (μA cm-2)
Area (cm²)
Sensing Interface
Solid
Lactate
(nmol)
Area Density (nmol cm-2)
0
2
4
6
8
10
0
500
1000
1500
2000
2500

FIG. 5C

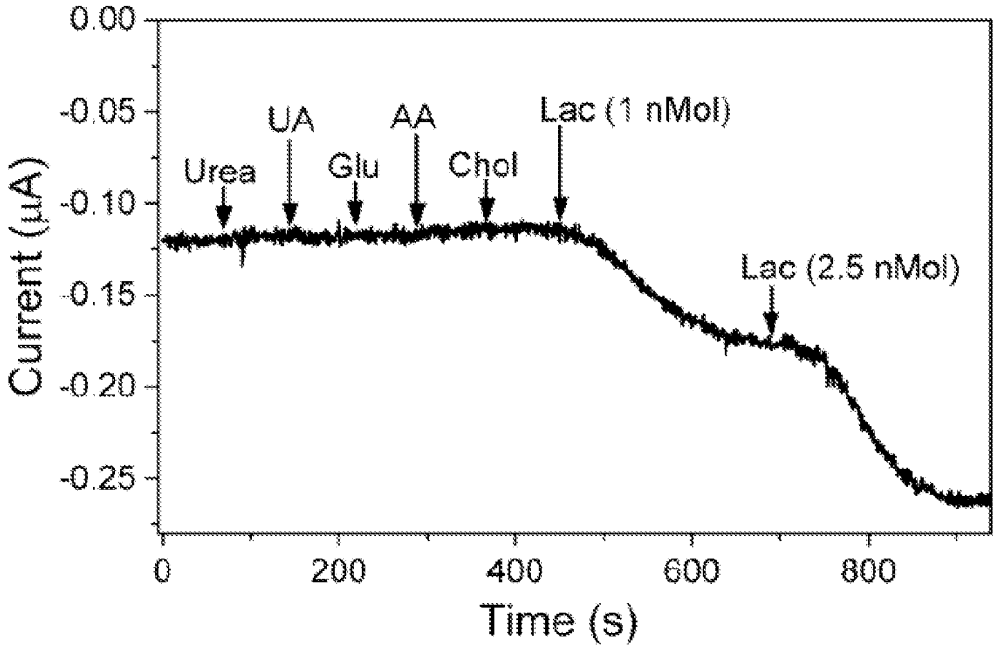
Urea
UA
Glu
AA
Chol
Lac (1 nMol)
Lac (2.5 nMol)
Current (μA)
Time (s)
0.00
-0.05
-0.10
-0.15
-0.20
-0.25
0
200
400
600
800

FIG. 5D

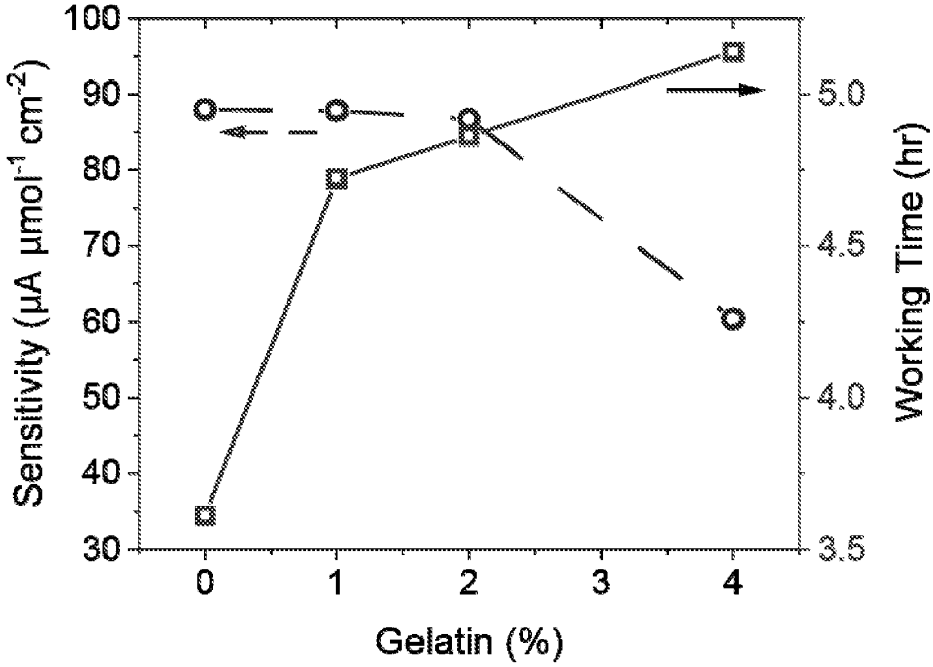
Sensitivity (μA μmol-1 cm-2)
Working Time (hr)
Gelatin (%)
100
90
80
70
60
50
40
30
5.0
4.5
4.0
3.5
0
1
2
3
4

FIG. 6A

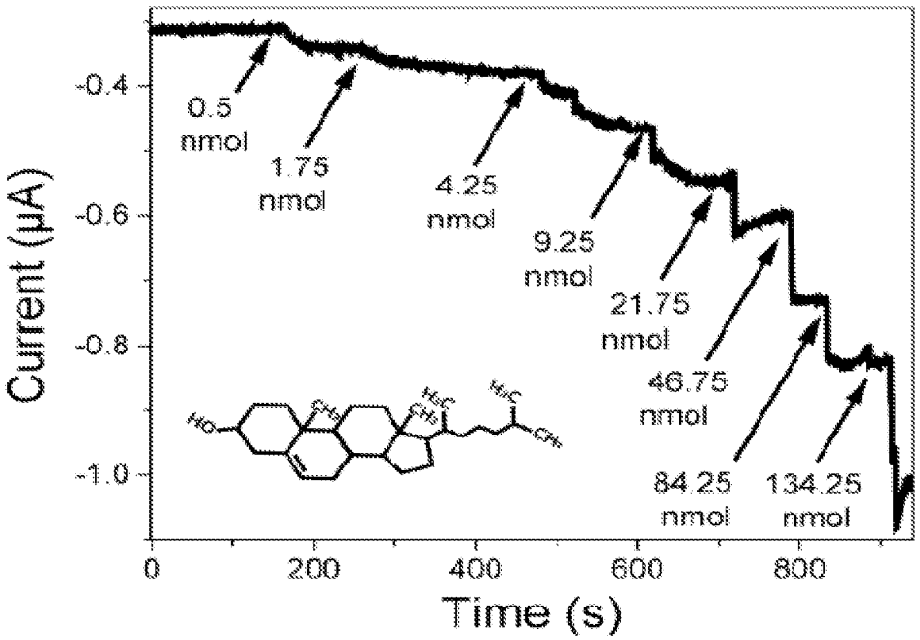
Current (μA)
Time (s)
-0.4
-0.6
-0.8
-1.0
0
200
400
600
800
0.5 nmol
1.75 nmol
4.25 nmol
9.25 nmol
21.75 nmol
46.75 nmol
84.25 nmol
134.25 nmol

FIG. 6B

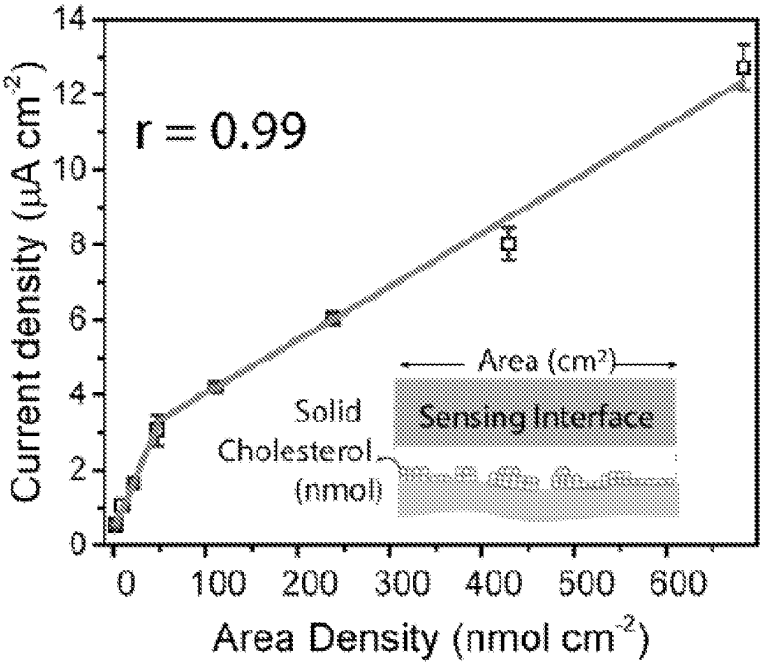
r = 0.99
Current density (μA cm-2)
Area Density (nmol cm-2)
Area (cm2)
Sensing Interface
Solid
Cholesterol
(nmol)
0
2
4
6
8
10
12
14
0
100
200
300
400
500
600

FIG. 6C

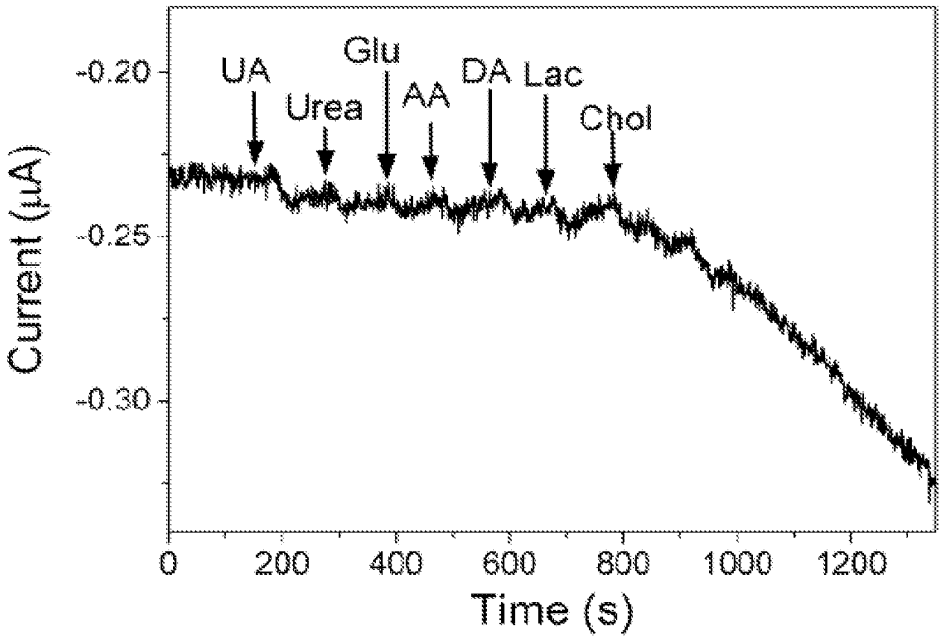
UA
Urea
Glu
AA
DA
Lac
Chol
Current (μA)
Time (s)
-0.20
-0.25
-0.30
0
200
400
600
800
1000
1200

FIG. 6D

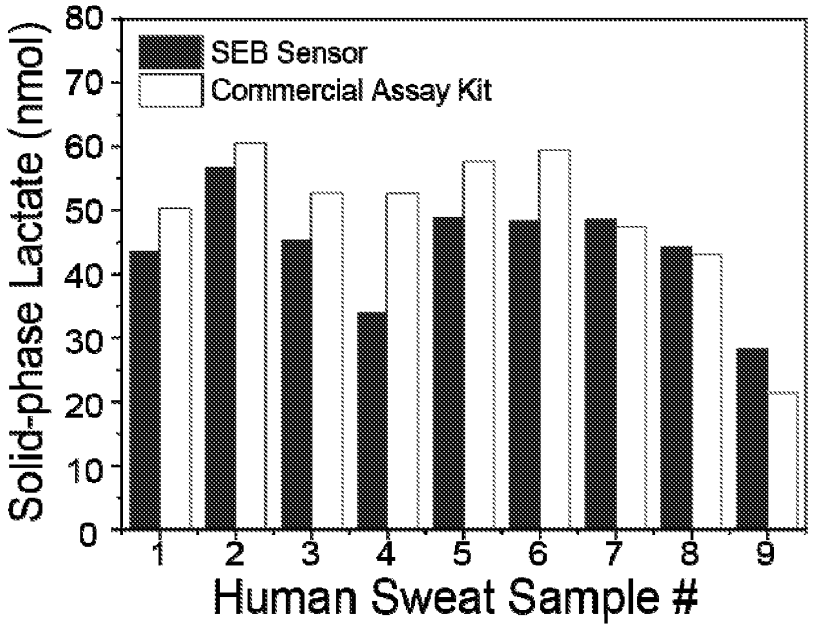
SEB Sensor
Commercial Assay Kit
Solid-phase Lactate (nmol)
Human Sweat Sample #
0
10
20
30
40
50
60
70
80
1
2
3
4
5
6
7
8
9

FIG. 7A

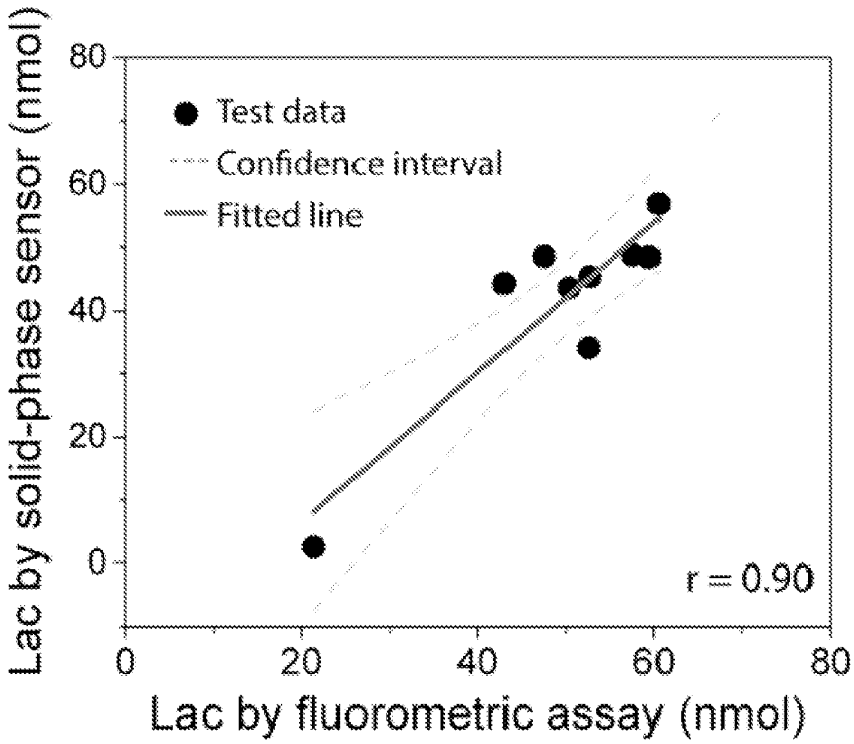
Test data
Confidence interval
Fitted line
r = 0.90
Lac by solid-phase sensor (nmol)
Lac by fluorometric assay (nmol)
0
20
40
60
80

FIG. 7B

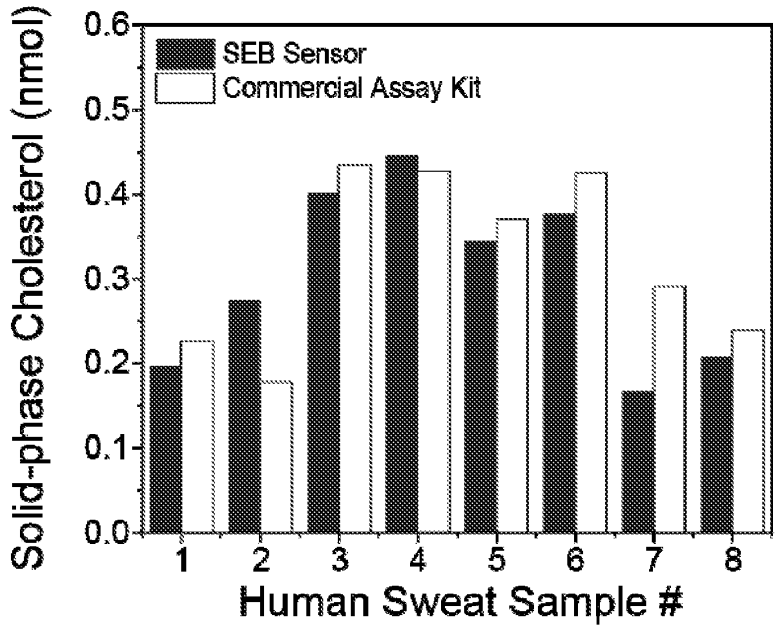
Solid-phase Cholesterol (nmol)
0.6
0.5
0.4
0.3
0.2
0.1
0.0
SEB Sensor
Commercial Assay Kit
1
2
3
4
5
6
7
8
Human Sweat Sample #

FIG. 7C

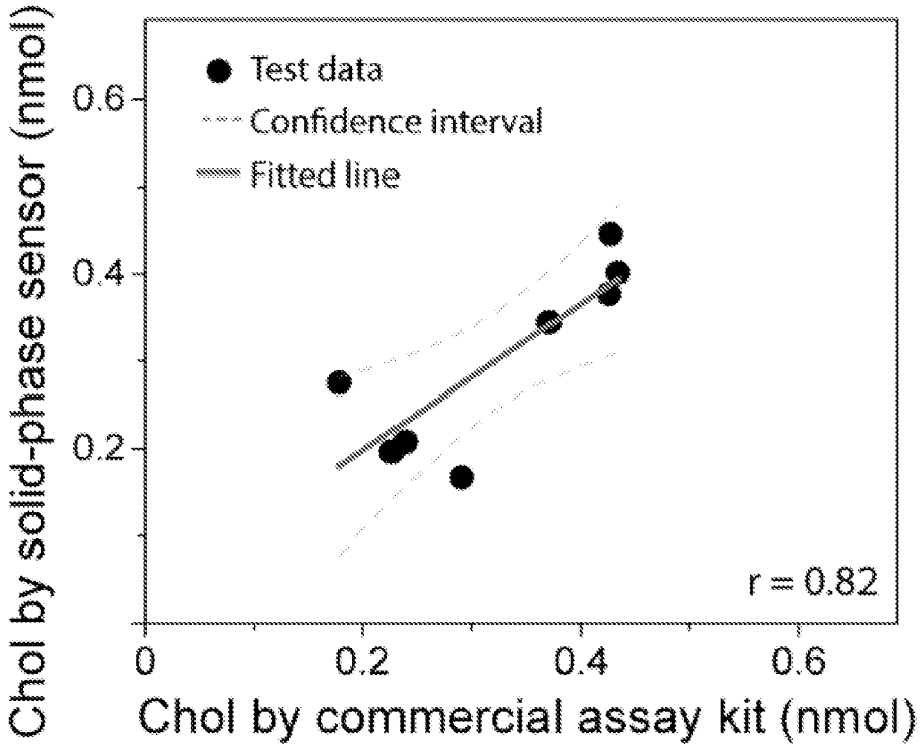
Chol by solid-phase sensor (nmol)
0.6
0.4
0.2
Test data
Confidence interval
Fitted line
r = 0.82
0
0.2
0.4
0.6
Chol by commercial assay kit (nmol)

FIG. 7D