n	cycle duration (seconds)	NSSD
16	1.84	0.66
20	2.30	1.28
40	4.60	0.36
58	6.67	2.66
64	7.36	1.29

The minimum number of pulses yielding sensor output profiles for methanol and ethanol with an NSSD of at least 1.0 was 20. FIG. **4** illustrates the input temperature profile obtained for n=20, and FIG. **4A** illustrates the corresponding output profile of the sensor.

It is thus seen that the foregoing general objects have been satisfied. The invention provides a sensor apparatus and method for operating a sensor that overcomes the drawbacks of prior art methods. When the sensor apparatus is operated as described above, an optimized temperature profile may be calculated and the difference between the output profiles of the sensor as between two analytes enhanced. The invention can further be used to minimize the cycle length for the sensor for any assigned output profile differentiation metric value.

While particular embodiments of the invention have been shown, it will be understood that the invention is not limited thereto since modifications may be made by those skilled in the art, particularly in light of the foregoing teachings. For example, while the invention has been described particularly with reference to sensor output conductance profiles in a temperature ramped sensor, the invention is not limited thereto, but rather finds applicability with other profiles and measurements. It is, therefore, contemplated by the appended claims to cover any such modifications as incorporate those features which constitute the essential features of these improvements within the true spirit and scope of the invention. All references cited herein are hereby incorporated by reference in their entireties.

What is claimed is:

1. A method for operating a sensor to differentiate between first and second analytes in a sample, said sensor being capable of having a variable temperature profile applied thereto and said sensor generating an output profile upon sensing an analyte, the method comprising the steps of:

determining a temperature profile for said sensor which will enhance the difference in the output profiles of the sensor as between the first analyte and the second analyte;

determining a first analyte output profile as observed when said temperature profile is applied to said sensor;

determining a second analyte output profile as observed when said temperature profile is applied to said sensor; introducing said sensor to said sample while applying said temperature profile to said sensor;

obtaining a sample output profile; and

evaluating said sample output profile as against said first and second analyte output profiles to thereby determine whether said first or said second analyte is present in said sample.

2. A method according to claim **1**, wherein said step of determining said temperature profile includes the steps of determining a first sensor model for said first analyte, said first sensor model predictive of an output profile of the sensor as a function of the temperature of the sensor; and determining a second sensor model for said second analyte, said second sensor model predictive of an output profile of the sensor as a function of the temperature of the sensor.

3. A method according to claim **2**, wherein said steps of developing said sensor models each include the steps of:

(1) determining a first temperature;

(2) determining a second temperature, the difference between said first and second temperatures defining a thermal range;

(3) pulsing the temperature of said sensor from said first temperature to a plurality of intermediate temperatures over said thermal range over a predetermined time period, at each of said intermediate temperatures allowing the temperature of said sensor to return to a measurement temperature;

(4) determining an output value for said sensor at said measurement temperature; and

(5) repeating steps (1)–(4) for a plurality of cycles.

4. A method according to claim **3**, each of said cycles being repeated over a time period equal to said predetermined time period.

5. A method according to claim **3**, the first temperature in a given cycle being identical to the second temperature from an immediately preceding cycle, wherein said second temperature for said given cycle is determined randomly.

6. A method according to claim **3**, further comprising the step of calculating a minimum temporal profile period by the steps of:

selecting a minimum pulse duration;

selecting a data set including a plurality of pulse numbers;

for each of said pulse numbers;

determining a temperature profile for said sensor which will enhance the difference in the output profiles of the sensor as between the first analyte and the second analyte;

observing a first analyte output profile as observed when said temperature profile is applied to said sensor;

observing a second analyte output profile as observed when said temperature profile is applied to said sensor; and

determining for said data set the minimum pulse number that allows for differentiation between said first analyte and said second analyte.

7. A method according to claim **6**, wherein said minimum pulse number is determined in accordance with the following relationship:

$$NSSD(y^1,y^2)\geq 1$$

wherein y^1 is the sensor output profile for the first analyte and $y^2$is the sensor output profile for the second analyte.

8. A method according to claim **1**, wherein said sensor is a microhotplate sensor, wherein said output profiles for said first and second analytes comprise conductance output profiles.

9. A method according to claim **1**, further comprising the step of activating an alarm if said first analyte is detected in said sample.

10. A method for operating a sensor to differentiate between first and second analytes in a sample, said sensor being capable of having a variable input profile applied thereto and said sensor generating an output profile upon sensing an analyte, the method comprising the steps of:

determining an input profile for said sensor which will enhance the difference in the output profiles of the sensor as between the first analyte and the second analyte;

determining a first analyte output profile as observed when said input profile is applied to said sensor;