ductive region comprises an aligned conductive material compositionally different than the nonconductive region. Each sensor, such as a resistor, provides an electrical path through the nonconducting region and the aligned conductive region, a first response such as an electrical resistance, when contacted with a first fluid comprising an analyte at a first concentration and a second different response when contacted with a second fluid comprising the analyte at a second different concentration, wherein the difference between the first response and the second response of the first chemically sensitive resistor being different from the difference between the first response and the second response of the second chemically sensitive resistor under the same conditions; an electrical measuring device electrically connected to the sensor array; and a computer comprising a resident algorithm; wherein the electrical measuring device detecting the first and the second responses in each of the chemically sensitive resistors and the computer assembling the responses into a sensor array response profile.

[0013] In yet another aspect, the present invention relates to a method for detecting the presence of an analyte in a fluid that can be either a liquid or a gas. The method comprising: providing a sensor array comprising first and second sensors, wherein the first sensor comprises a region of aligned conductive material; and contacting the sensor array with the analyte to produce a response thereby detecting the presence of the analyte. Preferably, the first and second sensors are first and second chemically sensitive resistors, each comprising a plurality of alternating regions comprising a nonconductive region, such as an organic material, and an aligned conductive region. The aligned conductive region comprises an aligned conductive material compositionally different from the nonconductive region. In this method, each resistor provides an electrical path through the nonconducting region and the aligned conductive region, a first response such as an electrical resistance, when contacted with a first fluid comprising an analyte at a first concentration and a second different response when contacted with a second fluid comprising the analyte at a second different concentration.

[0014] These and other features and advantages of the invention will be more readily apparent and understood when read with the detailed description that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] **FIG. 1** shows a graph of a typical resistance versus volume loading for a non-aligned composite sensor.

[0016] **FIG. 2** shows a graph of resistance versus volume loading for a composite sensor where the particles have been aligned.

[0017] **FIG. 3** shows optical micrographs of unaligned sensor (left) and aligned sensor (right) Black Pearl 2000 (40 wt %) in 1,2-polybutadiene.

DETAILED DESCRIPTION OF THE INVENTION AND PREFERRED EMBODIMENTS

[0018] Improvement of the signal to noise ratio of vapor sensors allows for lower detection limits by increasing the dynamic range. Lower detection limits allow for the identification of lower concentration of materials. This is particularly useful when detecting hazardous materials or in various medical applications. Surprisingly, it has now been discovered that by intentionally aligning the conductive region, there is an increase in the detection limit, i.e., the sensor is capable of detecting lower concentrations of analyte. As such, the present invention provides a sensor array for detecting an analyte in a fluid, comprising: first and second sensors wherein the first sensor comprises a region of aligned conducting material; and wherein the sensor array is connected to an electrical measuring apparatus. Preferably, the first and second sensors are first and second chemically sensitive resistors, each of the chemically sensitive resistors comprising: a plurality of alternating regions comprising a nonconductive region, such as a nonconductive organic material, and aligned conductive region, such as an aligned conductive material or particle. The aligned conductive region is compositionally different from the nonconductive region. The sensors such as resistors, provide an electrical path through the alternating regions comprising a nonconductive region, such as an organic material, and an aligned conductive region, a first response when contacted with a first fluid comprising an analyte at a first concentration, and a second response when contacted with a second fluid comprising the analyte at a second different concentration.

[0019] As explained previously, the response upon exposure to a vapor is dependent on various factors. One such factor is the percentage of connected paths in the alternating regions that are broken. The number of connected paths prior to exposure to a vapor is related to the percolation threshold. The percolation threshold is defined as the volume fraction at which the conductivity of the resistor increases rapidly. At low volume loadings, there are very few connected paths. At high volume loadings, there are many connected paths. Upon exposure to vapors, composite sensors will exhibit a large change in resistance near their percolation threshold. Before the advent of the present invention, the noise level associated with such low volume loadings was prohibitively high. However, by aligning the conductive region, lower volume loadings can now be used. Moreover, by aligning the conductive region, the percolation threshold is easier to obtain at low volume loadings.

[0020] The sensors of the present invention have an aligned conductive region that results in reduced percolation thresholds. Reduced percolation thresholds mean that a slight swelling of the composite sensor can result is a-very large change in resistance. This is because the few conductive particles are all participating in the connected paths, and any discontinuity in the connectivity results in a large resistance change. Thus, the alignment of the conductive region results in all of the particles participating in the connected electrical paths. By aligning the conductive region, these systems will produce a stable base resistance and thereby enhance the signal-to-noise ratio. To achieve equivalent or near equivalent noise levels, it is important to ensure that the alternating regions are stable. This can be accomplished in the present invention by, for example, cross-linking the polymer matrix in the nonconducting region or by any other suitable means.

[0021] The alignment of the conductive region, e.g., material or particles, is effected through the application of various processing techniques. For instance, polarization techniques can be used to align the conducting region. Suitable polar-