ISBN 978-85-63274-02-4

International Conference on Food and Agriculture Applications of Nanotechnologies

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São Pedro, SP
2010

1st Edition
1st print: 500 copies

Anais da 1. International Conference of Food and Agriculture Applications of Nanotechnologies – São Pedro: Aptor Software, 2010.
284 p.

ISBN 978-85-63273-02-4

1. Nanotechnologies – Events. 2. Ribeiro, Caue. 3. Assis, Odílio Benedito Garrido de. 4. Mattoso, Luiz Henrique Capparelli. 5. Mascarenhas, Sergio

International Conference on Food and Agriculture Applications of Nanotechnologies

NanoAgri 2010

Investigation of influence of temperature in the electrical response of a low cost plastic sensor, developed with nano film of gold and platinum, applied to agribusiness.

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Abstract – In order to measure the temperature that effect during the leaf wetness period, a low cost, disposable sensor was developed, using the 'line patterning' technique. The electrodes were made with gold and platinum to observe the difference of electrical response (electrical resistance (Ω)) with a temperature. The electric resistance of the two electrodes, with the thickness (T_h) of 20nm, were measured when submitted to different temperatures. The initial results are showing that gold is a good material as a layer to the electrode.

The temperature is considered a basic and important parameter to all scientific and technologic area, mainly to agribusiness. For example the temperature measurement, in the leaf wetness period (LWP), is a important parameter when data are used in precision agriculture. The LWP can be used in the prevention of specific fungical or bacterial diseases. In this work, a disposable and low cost sensor was developed for measuring the temperature ($_oC$) ($T_{(0C)}$). The substrate was the polyethylene therephtalate (PET), a cheap plastic, which can be used with gold (Au) and platinum (Pt) as electrodes. Over the PET a thin film (T_h=20 nm) of inorganic material was deposited using sputtering. The line patterning technique [1,2] is considered a simple and cheap technique, which can be used with regular office equipament and laboratory supplies. The pattern was designed in conventional graphical software, and printed on the PET substrate using a "laser jet" printer. In the sequence the PET was dipped into toluene and into methyl-ethyl-ketone, using an ultrassonic bath to remove the printer's toner and keep only the desired pattern on the substrate's surface. The sensors were sealed in a becker, in the same relative humidity (RH%), and then the system was heated, and the electrical resistance was measured. A high precision multimeter (PM 2525 Philips) and a portable multimeter were used. The sensibility of the sensor was investigated with the measuring the electrode's electric resistance at a given $T_{(0C)}$, based on the RTD principle [3]. Is possible to observe for the figure 1 that electrodes developing with gold, have a higher electrical response than the platinum in the same $T_{(0C)}$ condition. The sensor was developed with a cheap, simple and efficient technique. Both the platinum and the gold electrode as a sensor layer appear to have a linear behavior, but more investigation are necessary to determinate the effects of meteorological factors (as a low $T_{(0C)}$ and RH(%)) and encapsulation on the sensor's results.

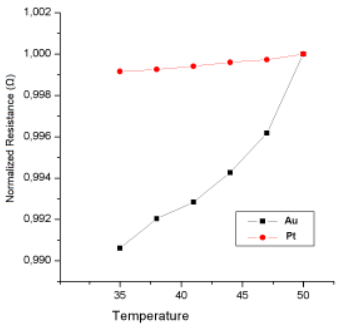

Figure 1: Normalized comparative graphic for the sensors

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