HASP2010- UND-UNF Payload #7
University of North Florida Team
Monthly Status Report for June 2010

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Our team did the following work during June 2010:

(1) The construction of payload body work is completed. The dimension and weight of the payload body are lower than the limit set by the HASP. Fig. 1 shows the payload body. Fabrication of the thermal blanket is going on. The thermal blanket will be wrapped over the body the payload to improve the thermal insulation.

Fig.1 Payload body

(2) The calibrations of nanocomposite sensors are going on. The calibration plots of some of the results are given in fig. 2 to 7. The results are summarized in the table-1.

Table: 1. Nanocomposite sensors and their parameters

Sensor#	Sensor Compositions	Linearity zone	Sensitivity of sensor = slope of the plot (Ohms/ppm)
J12	ITO	double	75.50 (low) and 14.45 (high)
NC1	8 Å TiO_2 over1000 Å ITO	double	1020.9 (low) and 387.7 (high)
NC2	60 Å WO_3 over1000 Å ITO	single	1.49
NC3	30 Å WO_3 over1000 Å ITO	single	1.50
NC4	150 Å WO_3 over1000 Å ITO	single	3.82
NC5	8 Å WO_3 over1000 Å ITO	single	4.84

The calibration of nanocrystalline ITO gas sensor J12 with ozone gas shows double linear zones (Fig.2). Low zone is below 2.5 ppm, while higher zone is above 2.5 ppm. Sensitivity of sensor is defined as the slope of the calibration plot. The sensitivity of sensor was found higher in the low concentration range up to 2.5 ppm than that of the concentration higher than 2.5 ppm.

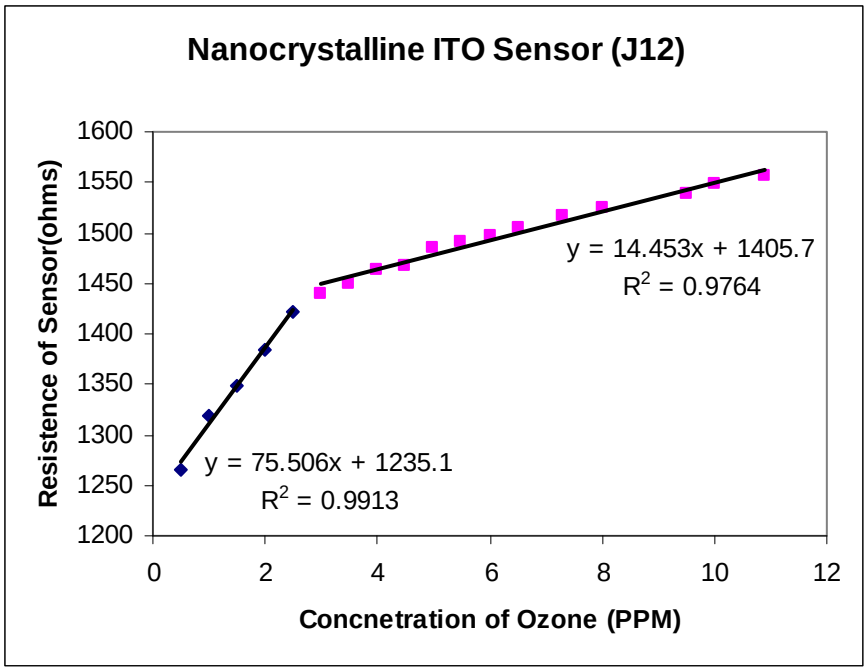

Fig.2. Calibration of nanocrystalline 1000 Å ITO thin film sensor (J12) with Ozone gas.

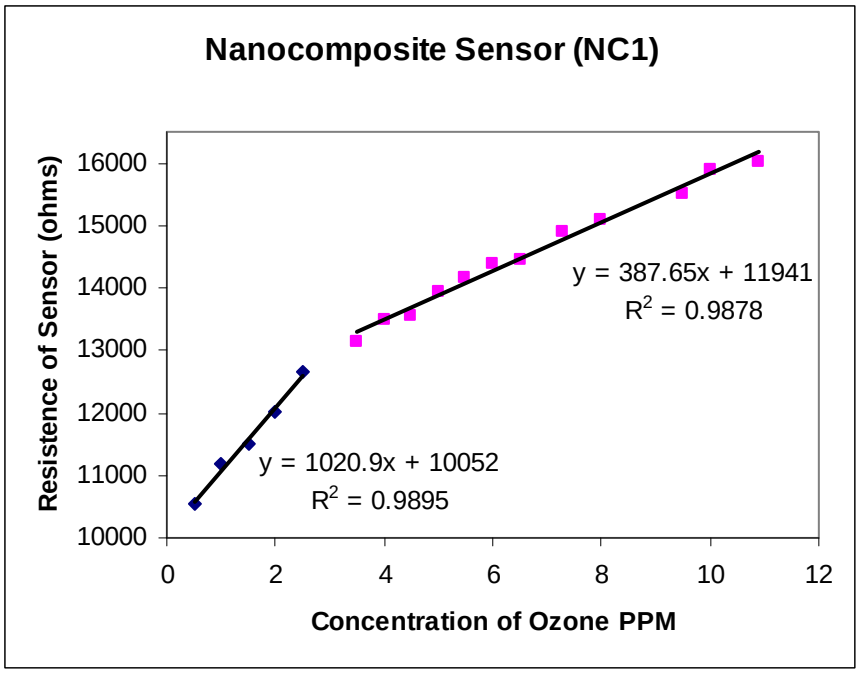

Fig.3. Calibration of nanocrystalline nanocomposite 8 ÅTiO_2 and 1000 Å ITO thin film sensor (NC1) with Ozone gas.

8 Å TiO_2 thin film was deposited over 1000 Å ITO thin film and the heat treatment was applied to make the nanocomposite sensor. The calibration of nanocomposite gas sensor NC1 with ozone gas shows double linear zones (Fig.3). The sensitivity of sensor was found higher in both linear zones than that of sensor J12. Further work on tuning of thickness of TIO_2 over ITO thin film is going on and will be reported in the next month report.

60, 30, 15 and 8 Å WO_3 thin film were deposited over 1000 Å ITO thin films and the heat treatment was applied to make the nanocomposite sensors NC2, NC3, NC4 and NC5, respectively. The calibration of plots of nanocomposite gas sensors (NC2 to NC5) with ozone gas are shown in Fig. 4 to 7. It was found that the plots have single linear zone. It was also observed that the sensitivity of sensors NC2 to NC5 was decreased to that of sensor J12, but the linearity of plots was improved over the entire range of ozone concentration up to 12 ppm. It was found that as the thickness of WO_3 increases the slope or sensitivity of nanocomposite sensor decreases and then nearly saturate above 30 Å thickness of WO_3 film over ITO film. We are going to utilize the J12, NC2 or better, and NC3 sensors in the payload. The three sets of the final version of sensors will be fabricated soon. One set will be supplied to the UND team for their testing, second for the HASP flight and third for the back up HASP flight.

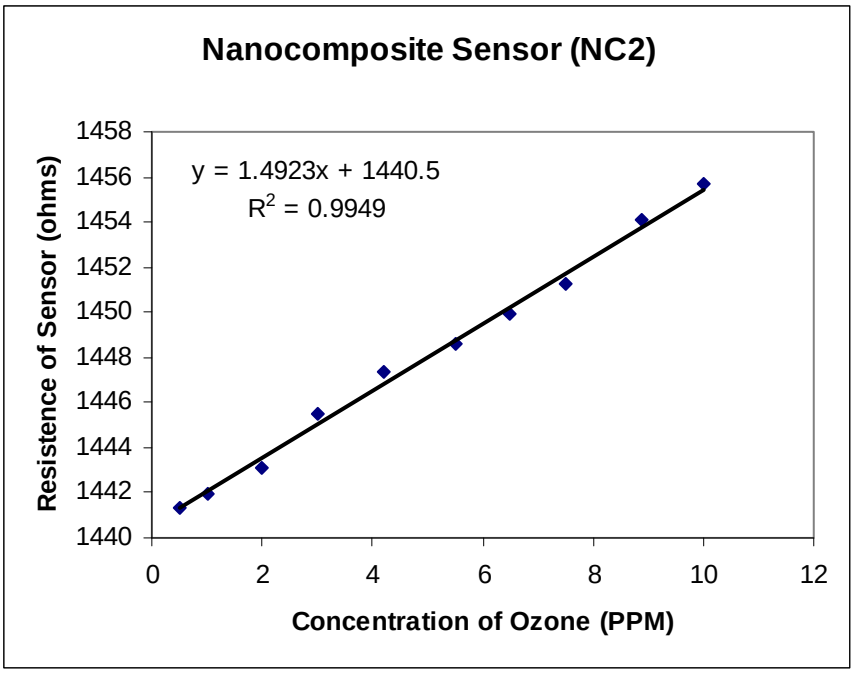

Fig.4. Calibration of nanocrystalline nanocomposite 60 Å WO_3 and 1000 Å ITO thin film sensor (NC2) with Ozone gas.

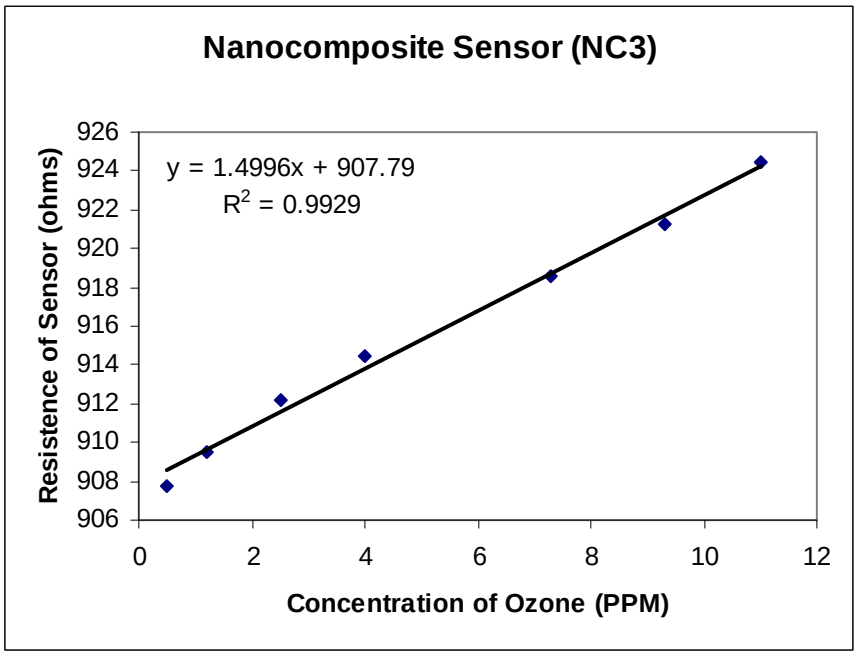

Fig.5. Calibration of nanocrystalline nanocomposite 30 Å WO_3 and 1000 Å ITO thin film sensor (NC3) with Ozone gas.

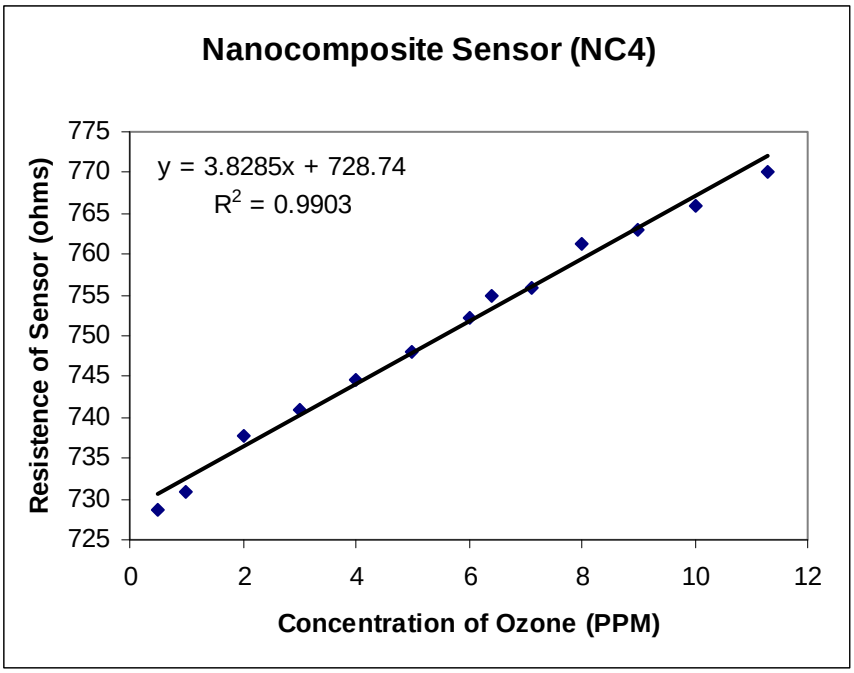

Fig.6. Calibration of nanocrystalline nanocomposite 15 Å WO_3 and 1000 Å ITO thin film sensor (NC4) with Ozone gas.

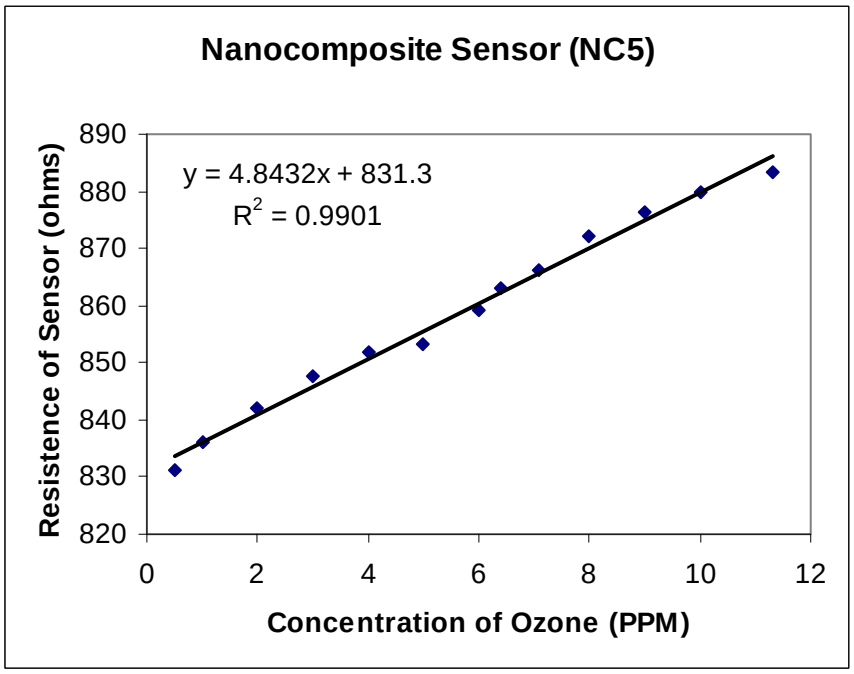

Fig.7. Calibration of nanocrystalline nanocomposite 8 Å WO_3 and 1000 Å ITO thin film sensor (NC5) with Ozone gas.

(3) Fabrication and calibration of organic-ITO nanocomposite sensors are going on.
(4) Testing of sensors at the different temperature are going on.
(5) Final version of PSIP is going on.