Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Detection of the Odor Signature of Ovarian Cancer using DNA-Decorated Carbon Nanotube Field Effect Transistor Arrays CHRISTOPHER KEHAYIAS, NICHOLAS KYBERT, JEREMY YODH, A. T. CHARLIE JOHNSON, Univ of Pennsylvania — Carbon nanotubes are low-dimensional materials that exhibit remarkable chemical and bio-sensing properties and have excellent compatibility with electronic systems. Here, we present a study that uses an electronic olfaction system based on a large array of DNA-carbon nanotube field effect transistors vapor sensors to analyze the VOCs of blood plasma samples collected from patients with malignant ovarian cancer, patients with benign ovarian lesions, and age-matched healthy subjects. Initial investigations involved coating each CNT sensor with single-stranded DNA of a particular base sequence. 10 distinct DNA oligomers were used to functionalize the carbon nanotube field effect transistors, providing a 10-dimensional sensor array output response. Upon performing a statistical analysis of the 10-dimensional sensor array responses, we showed that blood samples from patients with malignant cancer can be reliably differentiated from those of healthy control subjects with a p-value of 3×10^{-5}. The results provide preliminary evidence that the blood of ovarian cancer patients contains a discernable volatile chemical signature that can be detected using DNA-CNT nanoelectronic vapor sensors, a first step towards a minimally invasive electronic diagnostic technology for ovarian cancer.

Christopher Kehayias
Univ of Pennsylvania

Date submitted: 06 Nov 2015 Electronic form version 1.4