Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Bioelectronic Device Mimicking Human Sensory System based on Nanovesicle-Carbon Nanotube Hybrid Structure DAESAN KIM, HYE JUN JIN, SAN HUN LEE, Seoul National University, TAE HYUN KIM, Soonchunhyang University, JUHUN PARK, HYUN SEOK SONG, TAI HYUN PARK, SEUNGHUN HONG, Seoul National University — We have developed a nanovesicle-based bioelectronic nose (NBN) that could mimic the receptor-mediated signal transmission of human olfactory systems and recognize a specific odorant. The NBN was comprised of a single-walled carbon nanotube (CNT)-based field effect transistor and cell-derived nanovesicles containing human olfactory receptors and calcium ion signal pathways. Importantly, the NBN took advantages of cell signal pathways for sensing signal amplification. It enabled ∼100 times higher sensitivity than that of previous bioelectronic noses based on only olfactory receptor protein and CNT transistors. The NBN sensors exhibited a high sensitivity of 1 fM detection limit and a human-like selectivity with single-carbon-atomic resolution. Furthermore, these sensors could mimic a receptor-mediated cellular signal transmission in live cells. This versatile sensor platform should be useful for the study of molecular recognition and biological processes on cell membranes and also for various practical applications such as food conditioning and medical diagnostics.

Daesan Kim
Seoul National University

Date submitted: 07 Nov 2012 Electronic form version 1.4