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Transduction of Glycan-Lectin Binding using Near Infrared Fluorescent Single Walled Carbon Nanotubes for Glycan Profiling NIGEL REUEL, JIN-HO AHN, MIT - Chemical Engineering, JONG-HO KIM, Hanyang University, Ansan, Republic of Korea, JINGQING ZHANG, ARDEMIS BOGHOSSIAN, MIT - Chemical Engineering, LARA MAHAL, NYU - Chemistry, MICHAEL STRANO[1], MIT - Chemical Engineering — In this work, we demonstrate a sensor array employing recombinant lectins as glycan recognition sites tethered via Histidine tags to Ni2+ complexes that act as fluorescent quenchers for semi-conducting single walled carbon nanotubes embedded in a chitosan to measure binding kinetics of model glycans. Two higher-affined glycan-lectin pairs are explored: fucose (Fuc) to PA-IIL and N-acetylglucosamine (GlcNAc) to GafD. The dissociation constants (KD) for these pairs as free glycans (106 and 19 μM respectively) and streptavidin-tethered (142 and 50 μM respectively) were found. The absolute detection limit for the current platform was found to be 2 μg of glycosylated protein or 100 ng of free glycan to 20 μg of lectin. Glycan detection is demonstrated at the single nanotube level (GlcNAc to GafD). Over a population of 1000 nanotubes, 289 of the SWNT sensors had signals strong enough to yield kinetic information (KD of 250 $\pm$ 10 μM). We are also able to identify the locations of "strong-transducers" on the basis of dissociation constant (4 sensors with KD $<$ 10 μM) or overall signal modulation (8 sensors with $>$ 5% quench response). The ability to pinpoint strong-binding, single sensors is promising to build a nanoarray of glycan-lectin transducers as a method to profile glycans without protein labeling or glycan liberation pretreatment steps.

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