Supplementary information

Real-time Selective Monitoring of Allergenic *Aspergillus* Molds using Pentameric Antibody-Immobilized Single-Walled Carbon Nanotube-Field Effect Transistors

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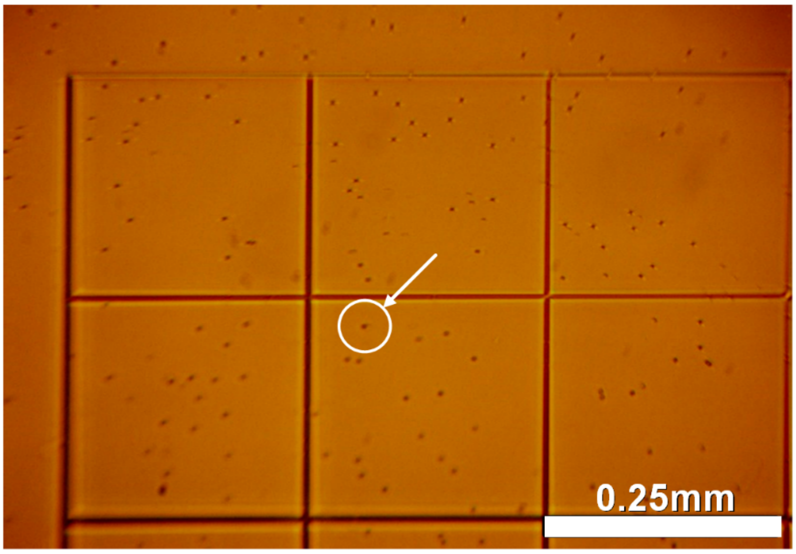

Figure S1. Magnified optical image of hemocytometer cells for counting fungal cells. Note that each square has a side length of 0.25 mm and the depth of the well is 0.1 mm exactly.

Supplementary information

Molds	*A. alternata*	*C. cladosporioides*	*P. chrysogenum*	*A. niger*
I_N (%)[a]	52.0 ± 9.5	62.1 ± 0.34	62.1 ± 9.4	108 ± 6.6

Table S1. I_N of WF-AF-1 Abs-immobilized SWNT-FET with injections of various molds: injection volume = 5 μL; each molds are suspended in a 1.5 mM PBS solution; initial volume of electrolyte solution = 50 μL; concentration of the injected mold solution = 1.8×10^7 spores mL^{-1}. Here, I_N (%) = $(I - I_0)/I_0 \times 100(\%)$, where I_0 = initial current response in the absence of molds, I= current response in the presence of molds.

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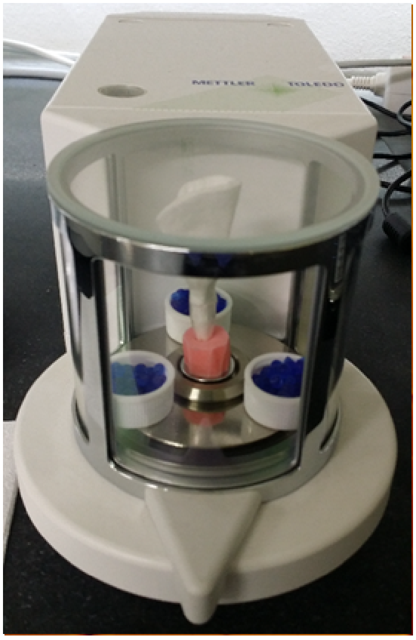

Figure S2. Measurement of mold mass using ultra-microbalance chamber (XF2U, Mettler Toledo). The dried molds were placed in a PCR tube, and three silica gels containers were placed around it to remove moisture effect.

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Determination of mobility of SWNT sensor transducers

Carrier mobility μ can be calculated from the following equation:

$$\mu = \frac{L}{W \cdot C_d \cdot V_{sd}} \cdot \frac{\partial I_d}{\partial V_g} \quad (1)$$

where L=10 μm, W=5 μm, V_{sd} =0.1 V denote SWNT channel length, width, source-drain voltage, respectively. Transconductance dI_d/dV_g =104.5 nA V^{-1} can be extracted from the slope of I_d-V_g curve in air shown in Fig. 5(d). In case of the gate capacitance C_d, we considered the parallel plate model and the serial quantum capacitance model with inter-tube coupling effects (V. K. Sangwan et al., ACS Nano, 2012, **6**, 7480.).

In case of parallel plate model:

$$C_d = \frac{\varepsilon_0 \varepsilon_d}{t_d} = \frac{3.9 \times 8.85 \times 10^{-14} F \cdot cm^{-1}}{300 \times 10^{-7} cm} = 1.15 \times 10^{-8} F \cdot cm^{-2} \quad (2)$$

In case of serial quantum capacitance with inter-tube coupling effects:

$$C_d = \left\{ \frac{1}{2\pi\varepsilon_0\varepsilon_d} \ln\left[\frac{2\Lambda_0}{d} \frac{\sinh(2\pi t_d / \Lambda_0)}{\pi} \right] + C_Q^{-1} \right\} \times \Lambda_0^{-1} = 7.9 \times 10^{-9} F \cdot cm^{-2} \quad (3)$$

where Λ_0^{-1}, d, and C_Q representing the linear density, diameter, and the quantum capacitance of nanotubes are 5 μm^{-2}, ~1.5 nm, and 4.0 $\times$ 10^{-10} F m^{-1}, respectively. The oxide thickness t_d was 300 nm. ε_0 and ε_d denote the vacuum permittivity and silicon dioxide dielectric constant, respectively. The calculated carrier mobility is 5.6 and 8.1 cm^2 $(V{\cdot}s)^{-1}$, respectively, for each value of capacitance.