

Supporting Information:

Additional liquid sensing experiments were performed in order to verify that the filament length of the sensor had no significant effect on the electrical response (i.e., relative electrical resistance change). **Figure S1** shows the relative electrical resistance change of half-length 3D helical sensors (i.e., total length of 15 mm) in short immersion test cycles of (1 s) / drying (600 s) with the same four solvents (e.g. ethanol, acetone, ethyl acetate and toluene). By comparing these relative changes to that presented in Figure 4b of the manuscript, we observed that the electrical response of the half-length 3D helical sensor was similar to that of the full-length one (maximum relative error $\sim 9.6\%$). Thus, the half-length 3D helical sensor exhibited comparable sensitivity and selectivity due to the liquid trapping capability.

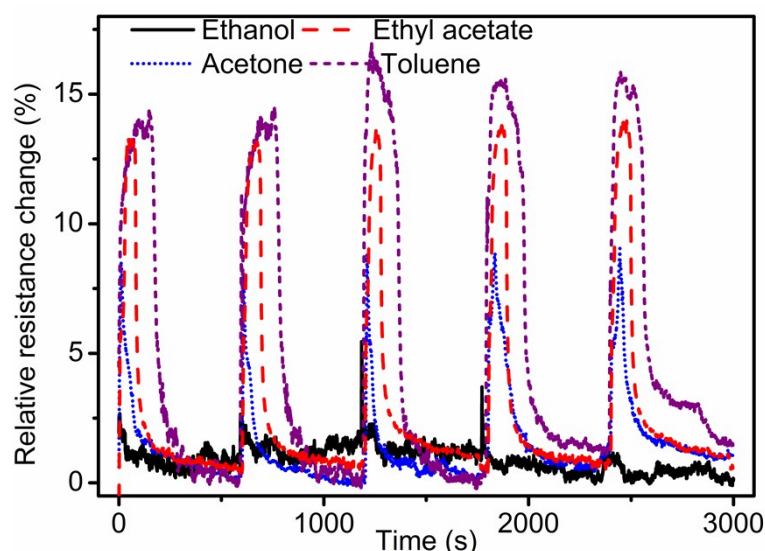


Figure S1. Relative electrical resistance change of half-length 3D helical sensors in short immersion cycles of (1 s) / drying (600 s) in four different solvents.

In the extra-long immersion tests, the geometry of the sensor had no significant

effect on its sensing behavior. Hence, the electrical response kinetic of the PLA nanocomposite sensor was characterized by immersing the straight line sensor in the same four solvent for 1 h (Figure S2). The relative resistance change had no obvious evolution when the sensor was immersed in ethanol. However when the sensor was immersed in toluene, the relative resistance change gradually increased and reached a plateau of 350% at 1800 s. For immersion in ethyl acetate and acetone, the relative resistance change increased much faster and reached a plateau of 500% and 550% at time of 1200 s and 900 s, respectively. This might be attributed to that Flory-Huggins interaction parameters of ethyl acetate and acetone are smaller than that of toluene (Table 1 of the manuscript). In other words, the electrical response of the sensors was determined by the Flory-Huggins interaction parameters in the extra-long immersion tests.

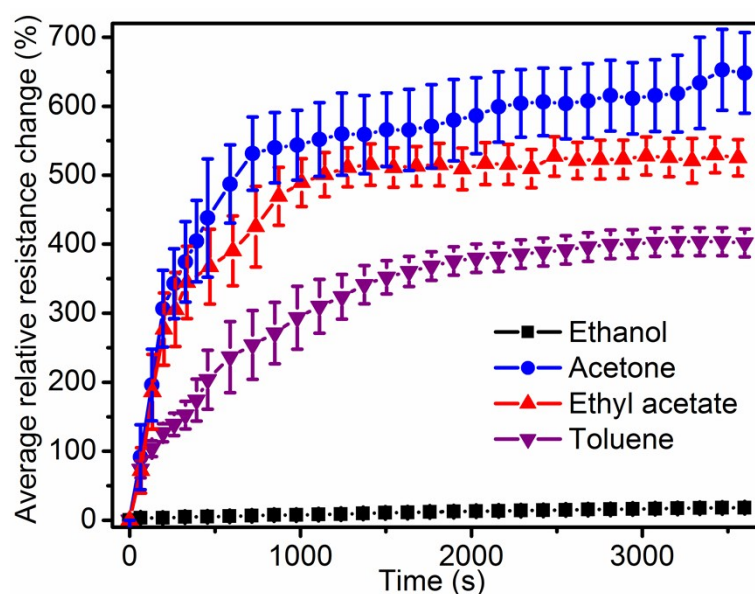


Figure S2. Relative electrical resistance change of straight line sensors immersed in four different solvents for 1h.