Highly Selective and Rapid Breath Isoprene Sensing Enabled by Activated Alumina Filter

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Supporting Information

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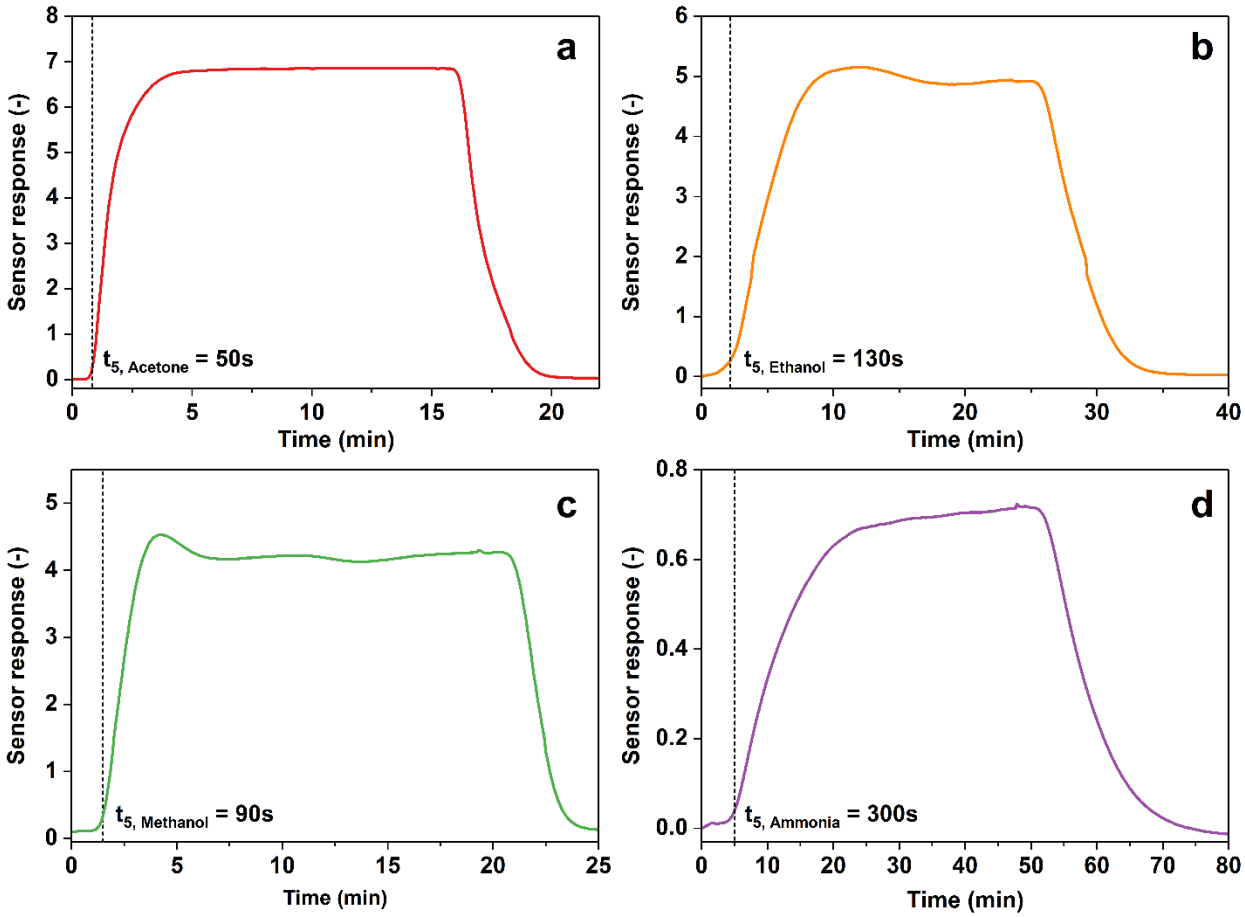

Figure S-1. The responses of a Pt-doped SnO_2 sensor with filter at 90% RH to 500 ppb concentrations of acetone **(a)**, ethanol **(b)**, methanol **(c)** and ammonia**(d)**. The breakthrough times, t_5, of the analytes through the filter are also indicated. Note the different time scale on the abscissa as analytes were exposed until a stable response was reached.

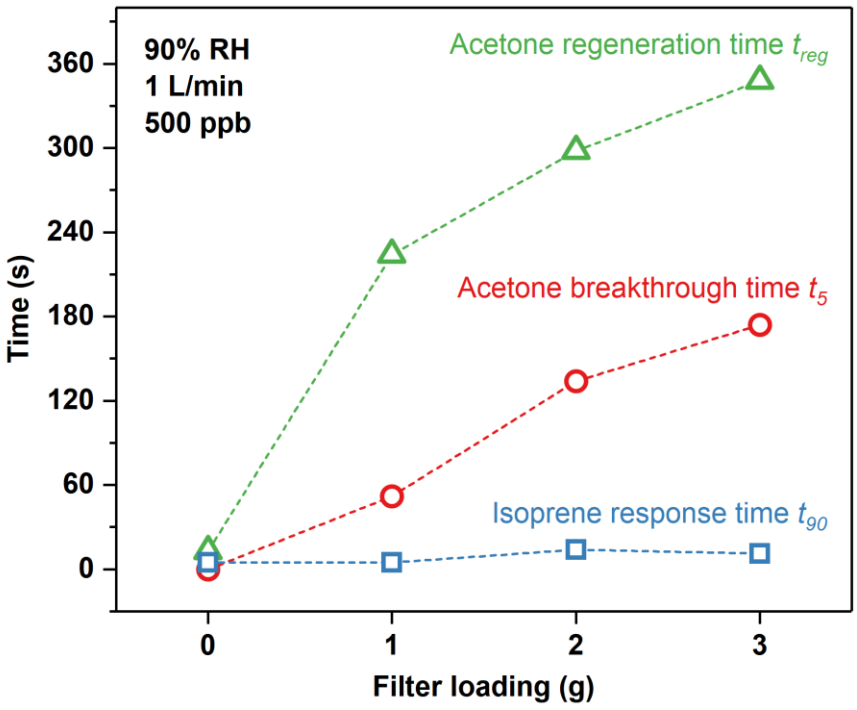

Figure S-2. Isoprene response time t_{90} (blue squares), acetone breakthrough time t_5 (red circles) and acetone regeneration time t_{reg} (green triangles) for different activated alumina filter loadings. Measurements were performed with 500 ppb analyte concentrations at 90% RH and 1 L/min. The t_{reg} is the time needed to recover 95% of the response after switching back to air.

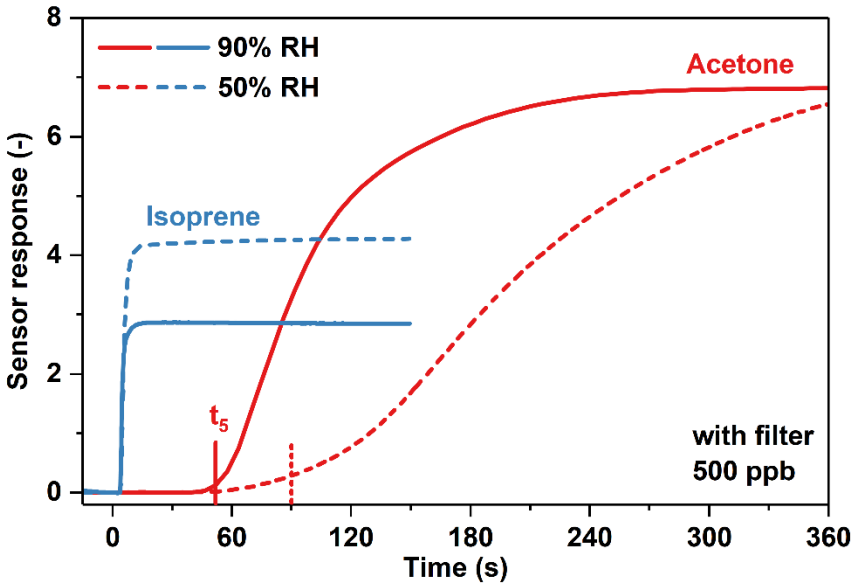

Figure S-3. The response of a Pt-doped SnO_2 sensor with 1 g activated alumina filter at 90 (solid) and 50 % RH (dashed) to 500 ppb of isoprene (blue) and acetone (red). The sensor response time to isoprene is hardly affected by relative humidity but the response is reduced, which is typical for SnO_2-based sensors.[60] In case of acetone, the breakthrough time t_5 increases with decreasing humidity (i.e. lower degree of surface hydration) consistent with literature[53] showing that sorption coefficients of volatile organic compounds depend on the metal-oxide and decrease with increased surface hydration.

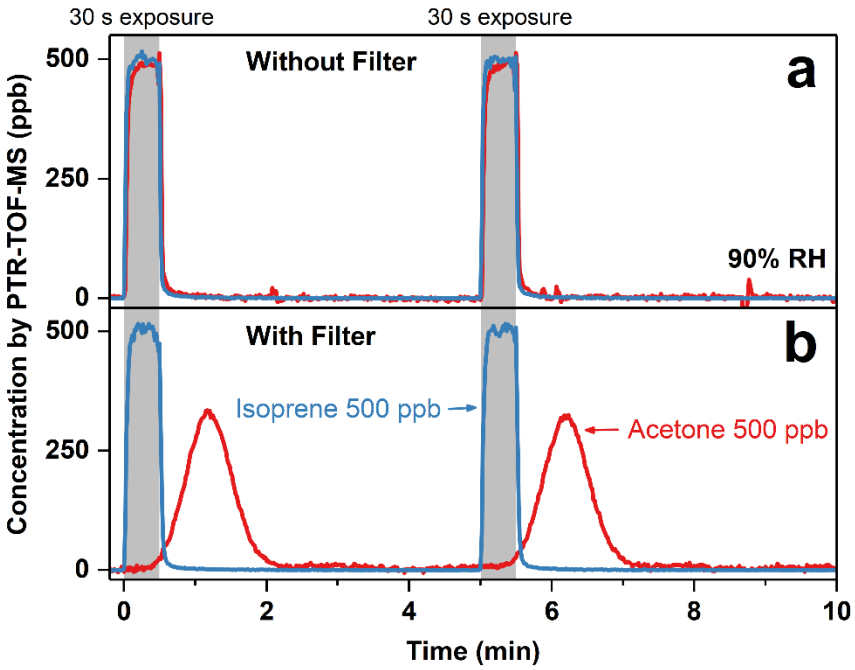

Figure S-4. Concentration of acetone (red lines) and isoprene (blue line) measured by a proton-transfer-reaction time-of-flight mass spectrometer (PTR-TOF-MS) for 30 s mixed pulses of 500 ppb acetone and 500 ppb isoprene at 90% RH. **(a)** Measured concentrations without filter showing the identical and simultaneous increase of acetone and isoprene during the exposure. **(b)** Concentrations measured with filter show the delay and spread of the acetone pulse, while isoprene is not affected, similar to the corresponding sensor results (Figure 4). Please note that response/recovery times of the PTR-TOF-MS differ from the one of the sensor. Importantly also, the area under the concentration curves for isoprene and acetone are identical (<5% deviation) without and with filter, confirming that the filter fully recovers after every exposure.

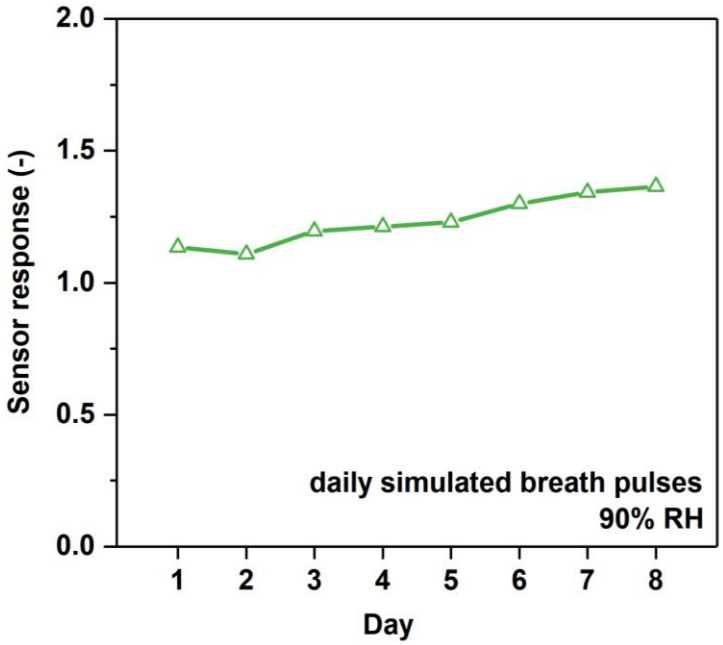

Figure S-5: Pt-doped SnO_2 response with filter during continuous operation for eight days. Response is evaluated after 30 s of exposure to simulated breath consisting of 106 ppb isoprene, 477 ppb acetone, 461 ppb methanol and 833 ppb ammonia at 90% RH.

References:

60. Barsan, N.; Weimar, U., Understanding the fundamental principles of metal oxide based gas sensors; the example of CO sensing with SnO_2 sensors in the presence of humidity. *J. Phys.: Condens. Matter.* **2003**, 15 (20), R813-R839.