

## Breath-figure molding of polymer transistors to implement flexible and high performance NO<sub>x</sub> sensors

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Strategically designed polymer semiconductor thin film morphology with both high responsivity to the specific gas analyte and high signal transport efficiency is reported to realize highly selective/sensitive flexible NO<sub>x</sub> sensors. Breath-Figure (BF) molding of polymer semiconductor enables finely defined degree-of-porosity of film with high reproducibility, while conserving charge transport nature of organic field effect transistor (OFET). The optimized BF-OFET with donor-acceptor copolymer renders the maximum responsivity over 10<sup>4</sup> %, sensitivity over 774 %/ppm and limit of detection (LOD) of 110 ppb against NO exposure. From wide dynamic range of 0.2-10 ppm NO exposure, the response time was maintained as 100-300 seconds which is fast enough for safety purpose in practical application. Selectivity to NO<sub>x</sub> analytes is tested by comparing the responsivity of BF-OFET to various gases. Finally, flexible BF-OFET is demonstrated on a plastic substrate which maintains a sensitivity of 500 %/ppm and LOD of 215 ppb after 10,000 bending tests at 1% strain.