YTC America Inc.

PRINTED THIN FILM AMMONIA GAS SENSOR

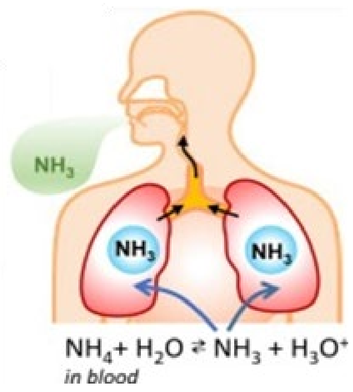
Detecting Ammonia at ppm-Level and High Relative Humidity

According to the World Heath Organization 10% of the world population is affected by chronic kidney disease (CKD) and millions die of it annually. Elevated levels of ammonia (NH_3) and trimethylamine (TMA) can in breath can be an indication of CKD, which may be treatable at an early stage. In contrast to blood panels detecting ammonia by a breathalyzer is less invasive and self tests can be performed at home. Typical ammonia levels are in a range of 0.5 ppm to 10 ppm and need to be detected at a relative humidity of 90%. Ammonia breath sensors need to be inert to exhaled oxygen, nitrogen and carbon-dioxide.

Screening For Chronic Kidney Disease (CKD) By Detecting Ammonia in Human Breath

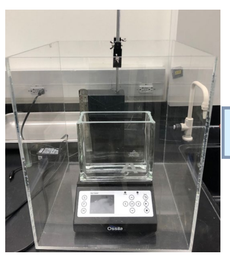
World Health Organization

According to the WHO 10% of the world's population suffer from CKD and millions die annually

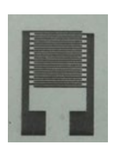


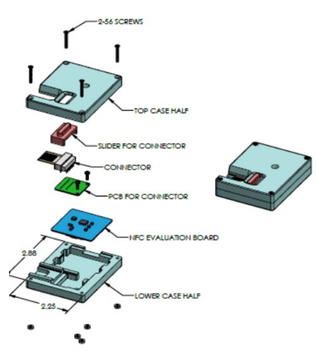
Ammonia from the blood-stream is passed to the lungs

Elevated Ammonia levels in breath can be a non-invasive method for early CKD detection



Spray Coater



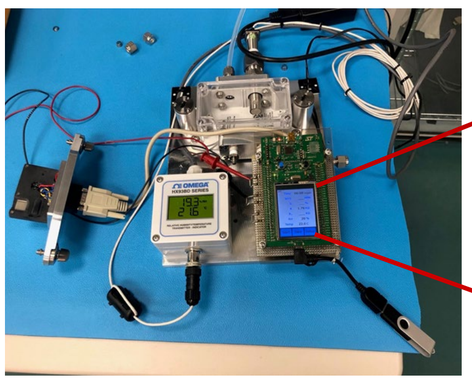


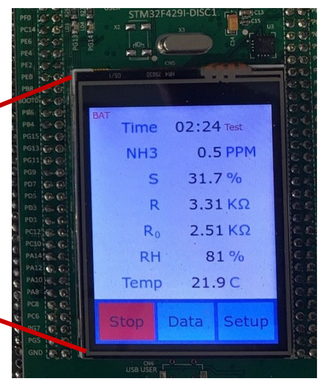
Print Electrodes

Dip-coat PANI on PET film
- Dopant A for NH_3
- Dopant B for TMA

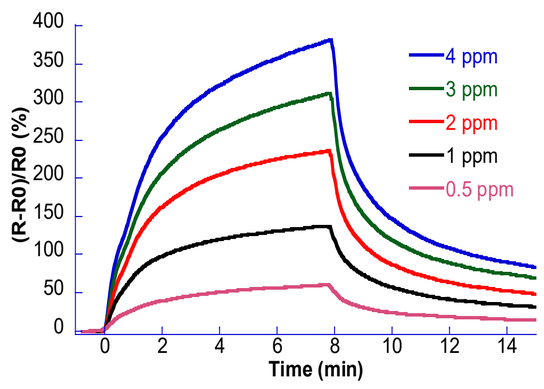
Insert Sensing Strip

Gas Manifold mass-flow-controllers for controlled amounts of NH_3 / TMA in humid and CO_2-rich air

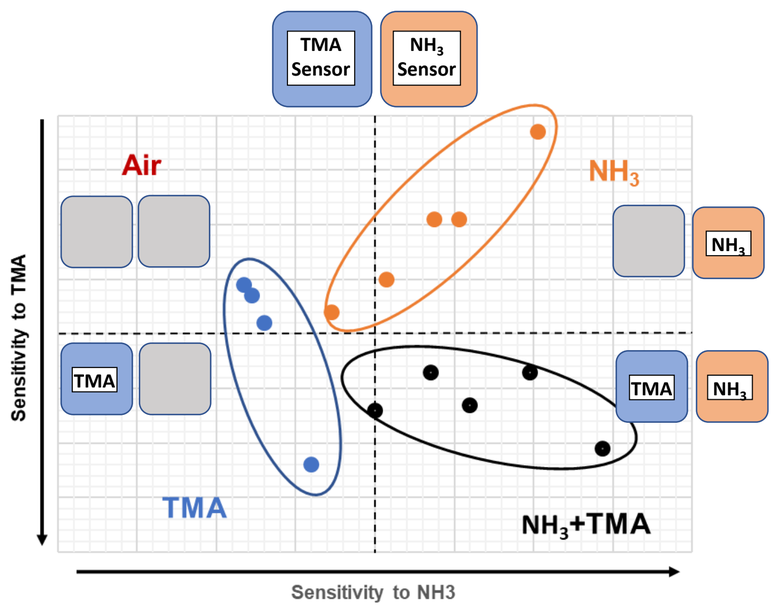




Ammonia and TMA Sensor Setup with On-Board Temperature and Humidity Sensor



Typical sensing traces at 90% humidity:
Initial slope is proportional to NH_3 / TMA gas concentration



Sensor Selectivity to NH_3 vs TMA

HIGHLIGHTS

- Breathalyzer with single use ammonia detector strips conceptualized
- Ammonia (NH_3) and Trimethylamine (TMA) sensitive Polyaniline (PANI) films with interdigitated electrodes on PET substrates demonstrated
- Prototype sensor electronics and software developed
- 1 to 10 ppm +/- 0.5 ppm detection of Ammonia at 90% relative humidity
- Typical sensor response time of 30 seconds
- High slectivity between NH_3 and TMA with distinct dopants
- No sensitivity to oxygen, nitrogen, and carbon-dioxide

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