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CONDUCTING POLYMER SENSOR ARRAYS FOR AIR-QUALITY MONITORING APPLICATIONS

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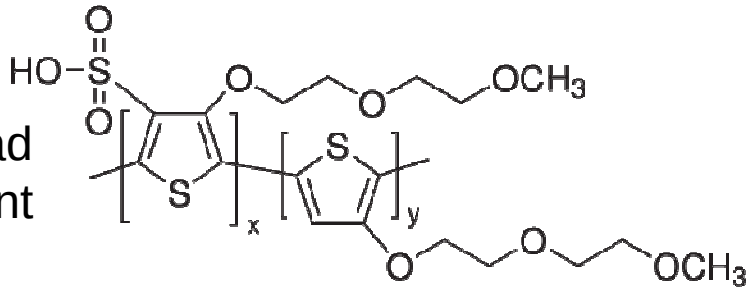
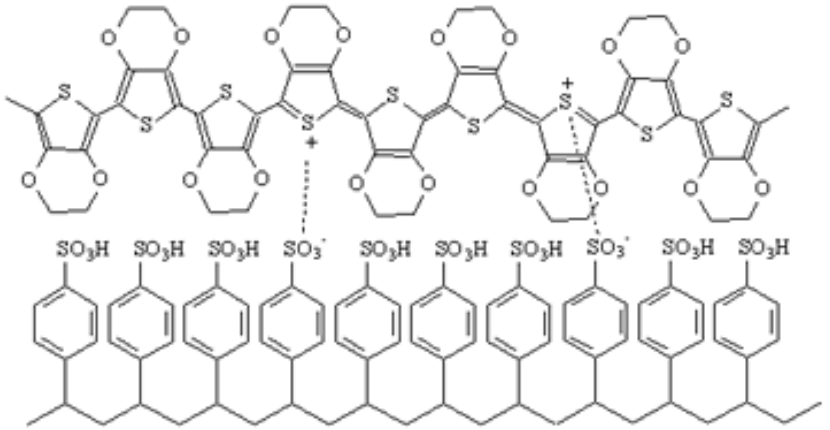
The problem

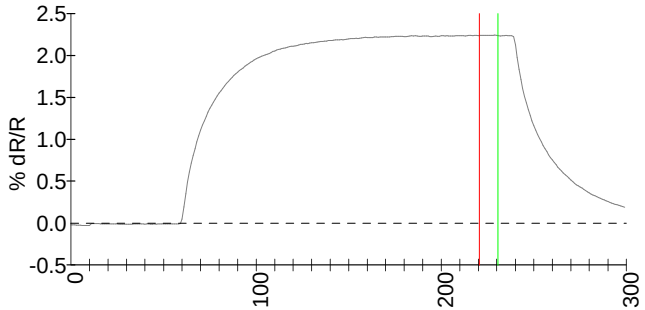
- There are few practical ammonia sensors that can be used online and in real time applications in the water industry.
- Current contact based sensors are usually ion-selective electrodes – subject to fouling
- Need high sensitivity for some applications
- Need low sensitivity –but wide range of operation for other applications

Conducting polymers

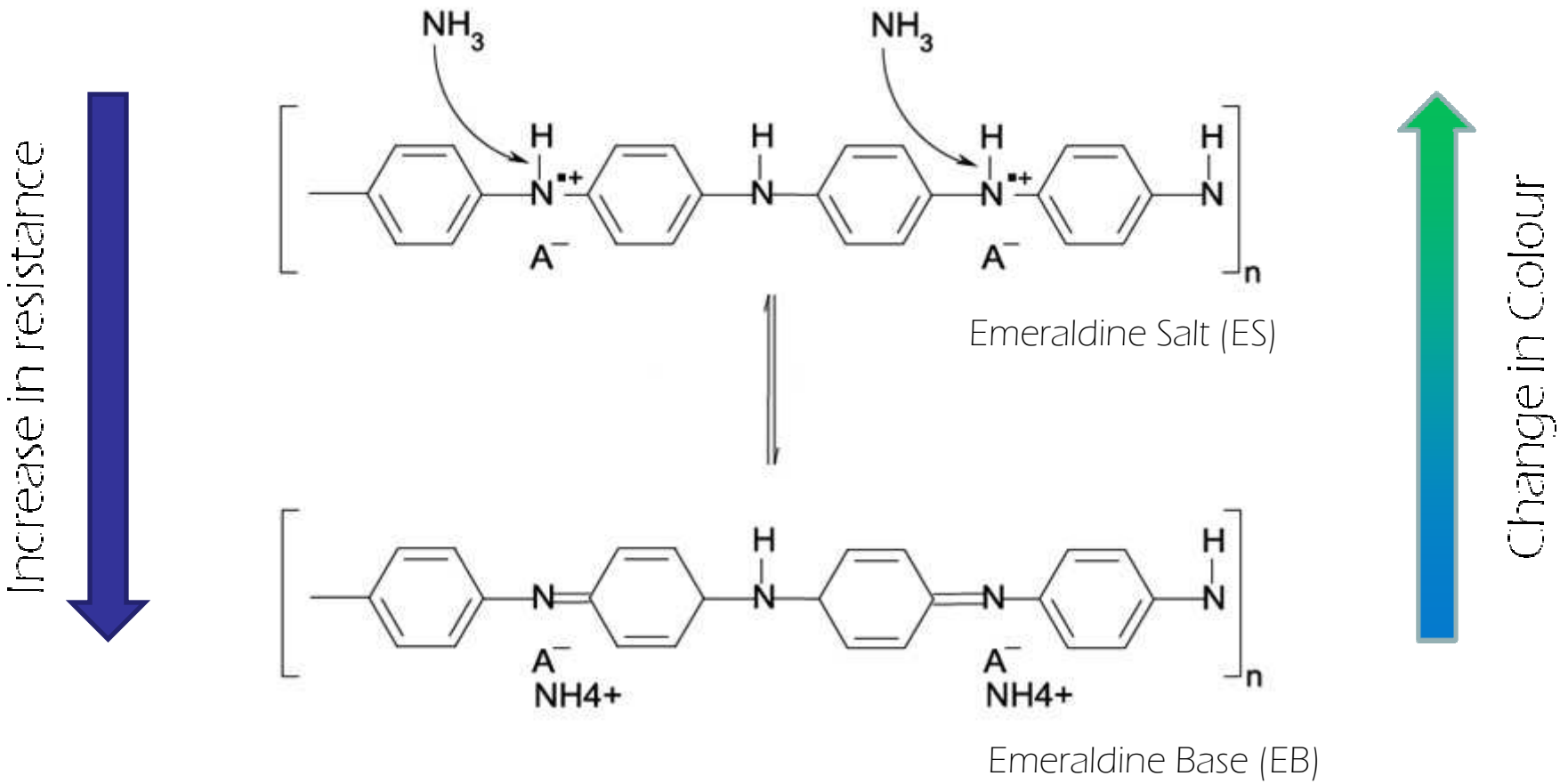
Organic Conducting polymers show broad and overlapping specificity to different volatile organic compounds



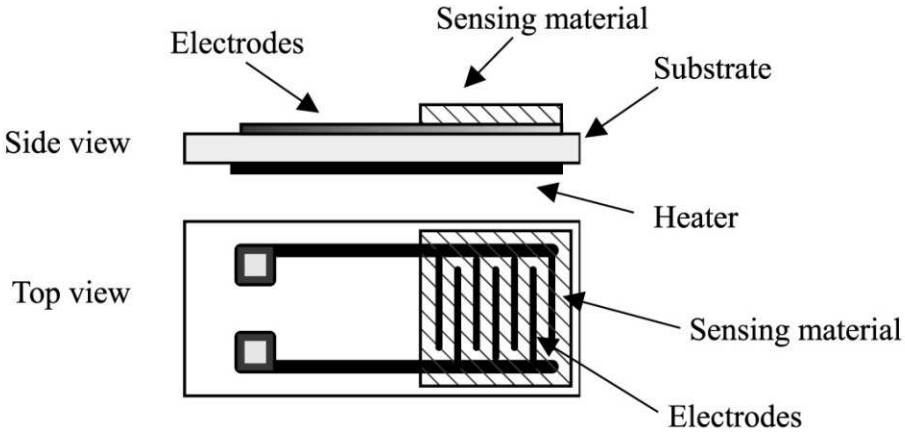


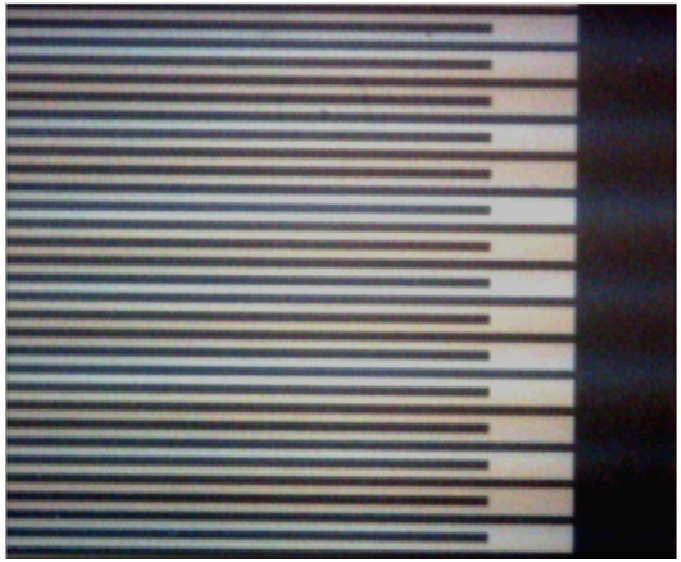


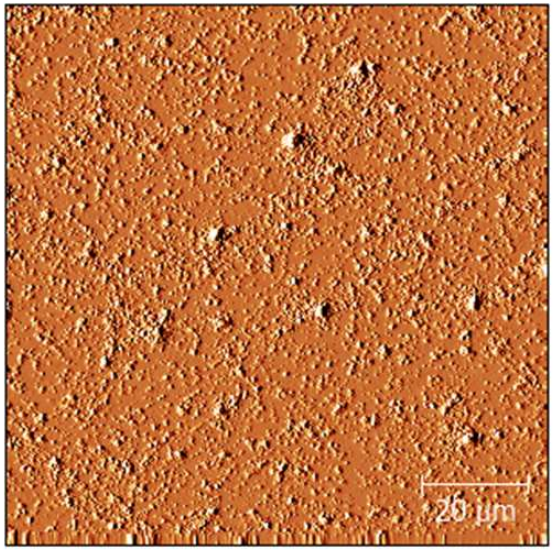
Polyaniline: ammonia sensing properties



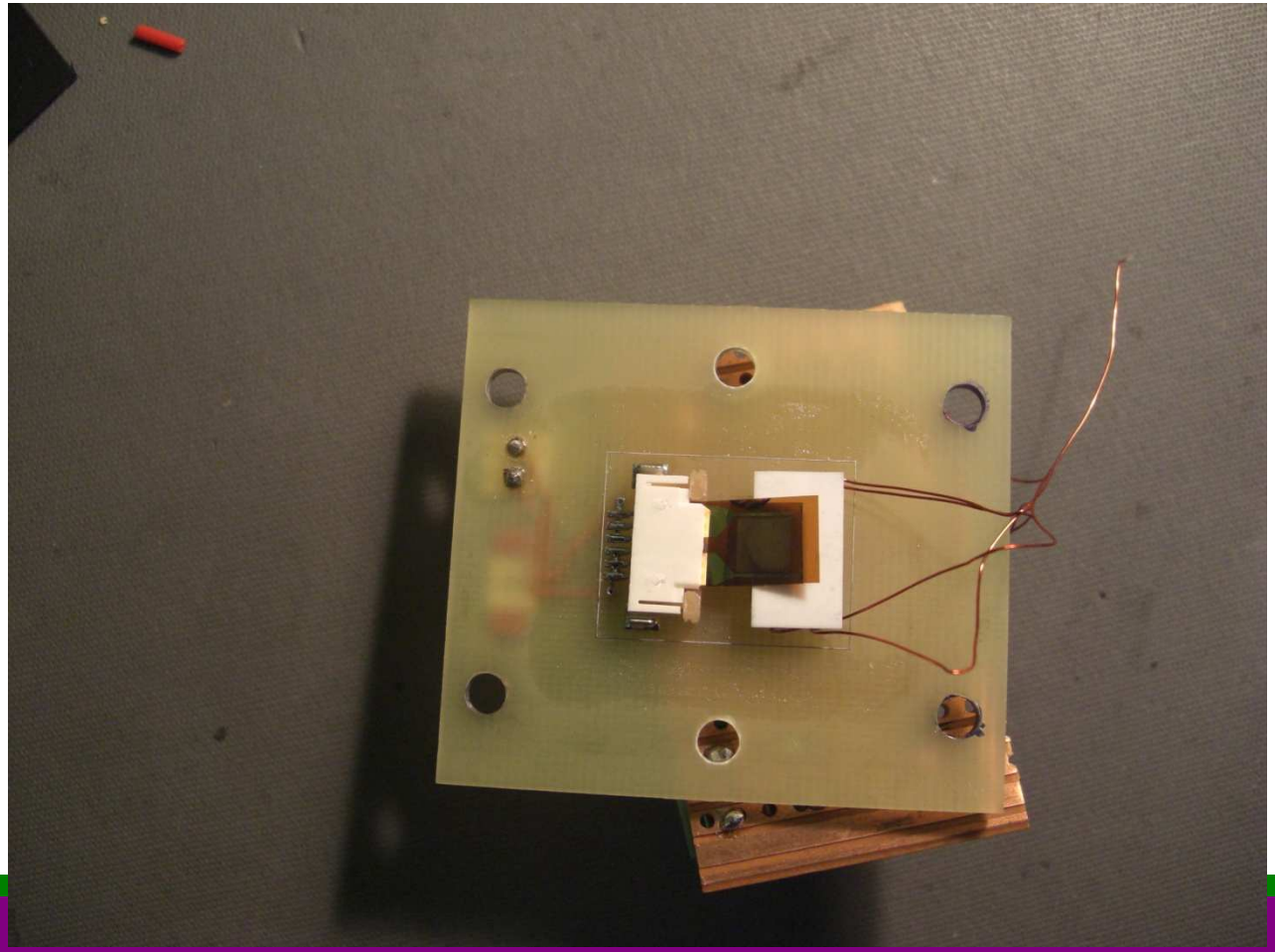
A^-, Dopant anion: Sulfosuccinic Acid


Electrodes
Sensing material
Substrate
Side view
Heater
Top view
Sensing material
Electrodes

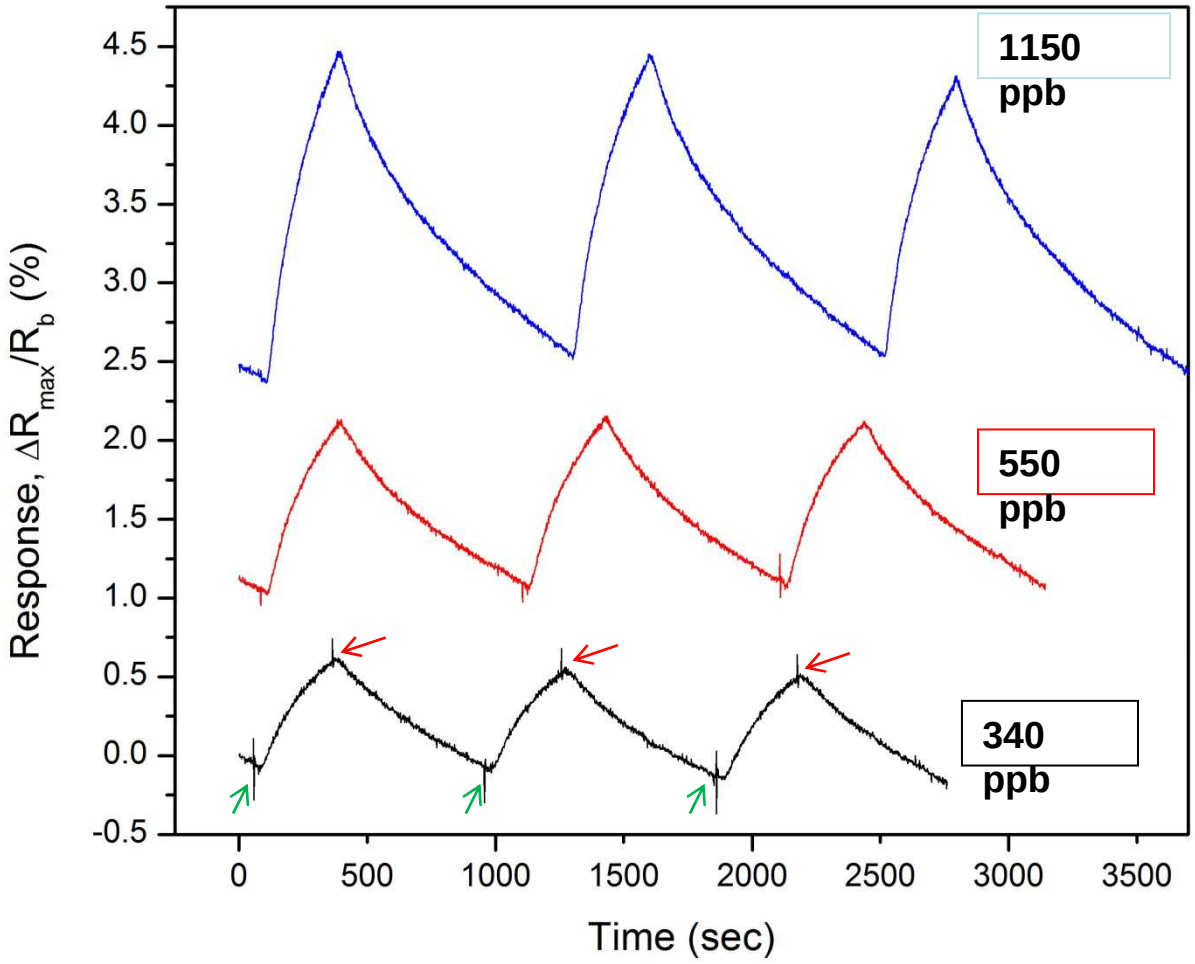



20 µm

Sensor



Ammonia sensing results (1)

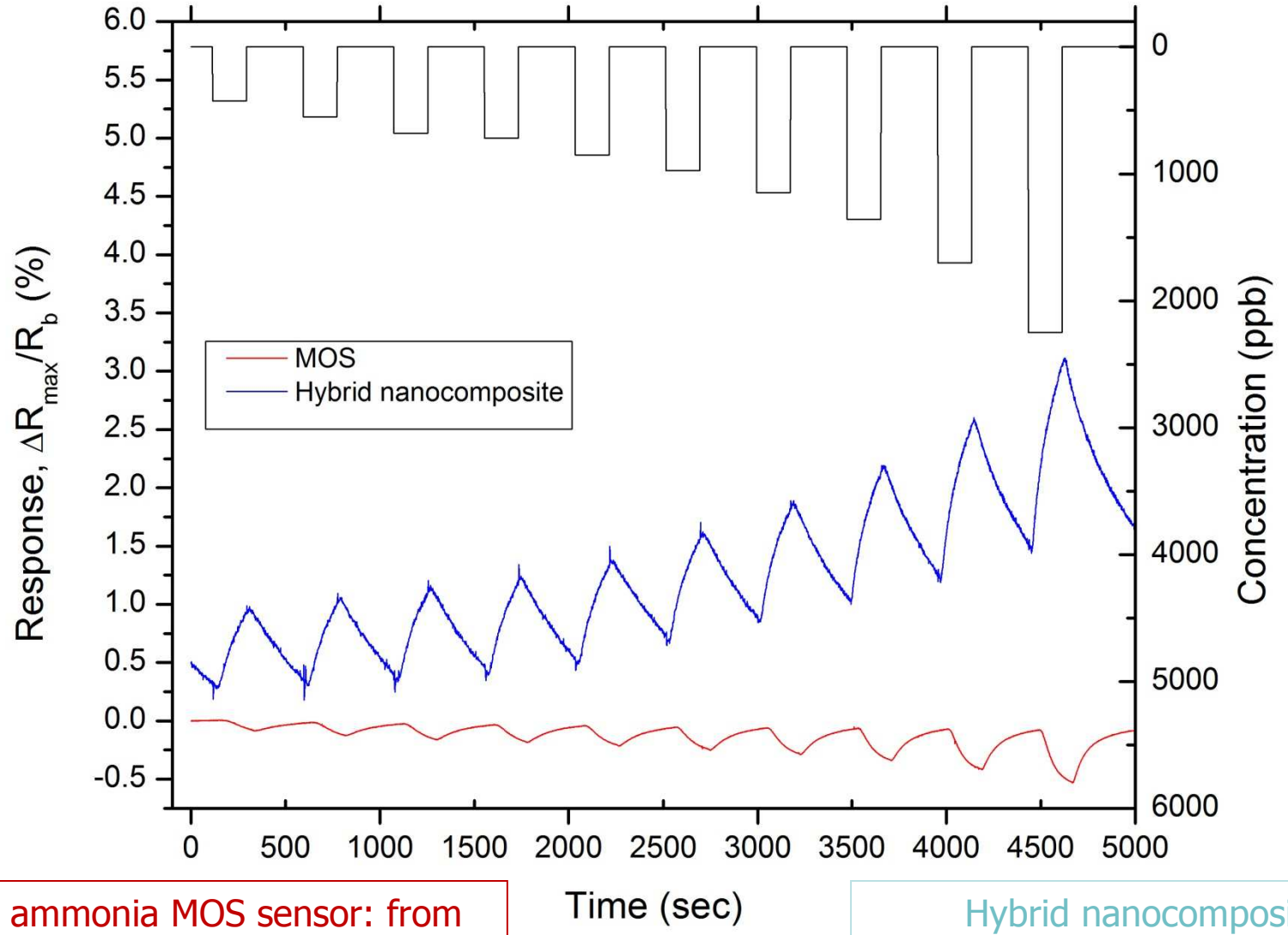


↗ ON

↗ OFF

Dip coated on Kapton® @ 80 ºC

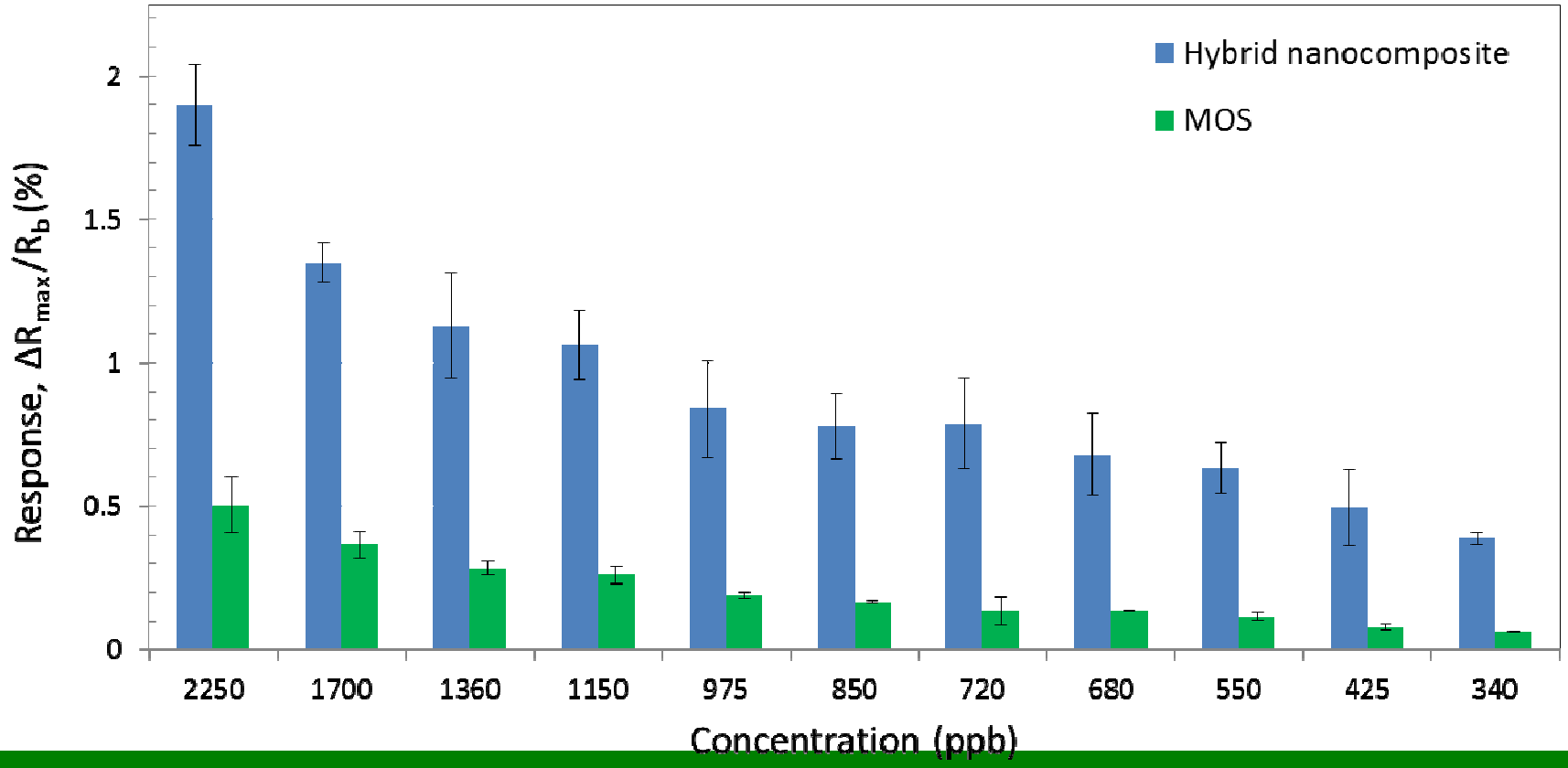
Ammonia sensing results (2)



Commercial ammonia MOS sensor: from Synkera technologies, inc.

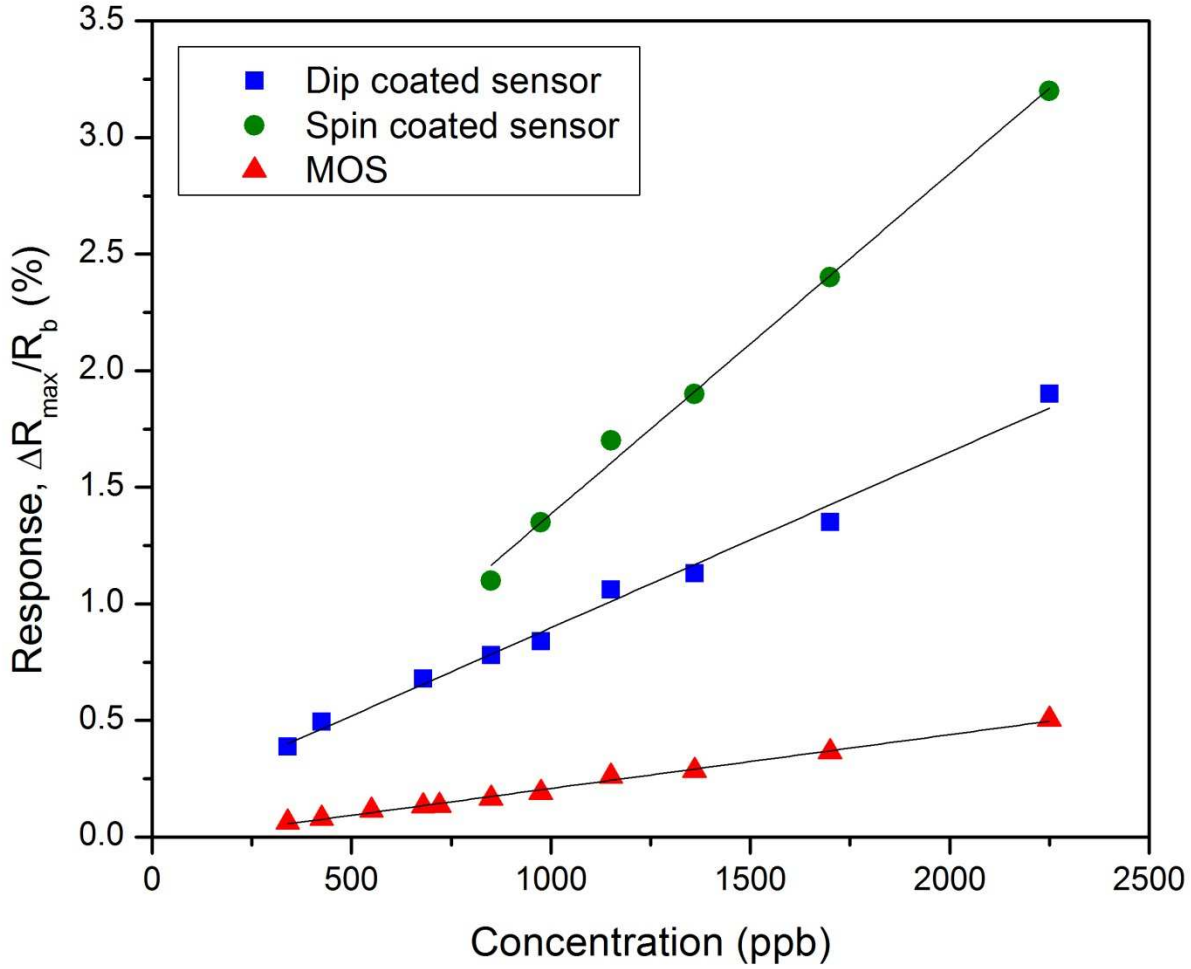
Hybrid nanocomposite, dip coated on Kapton® @ 80 ºC

Ammonia sensing results (3)



POWER CONSUMPTION! -> Hybrid sensor operates at 80 ºC vs. MOS sensor at >200 ºC

Ammonia sensing: effect of deposition method



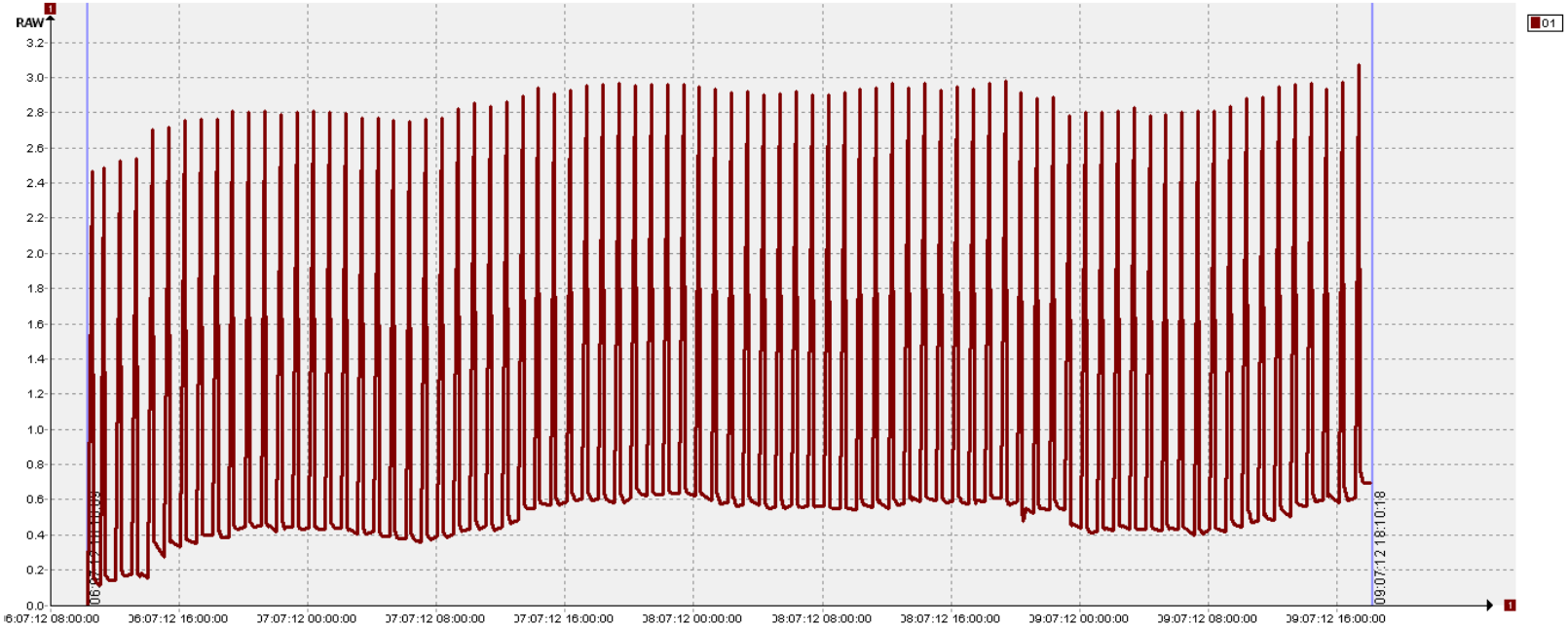
Sensitivity: Slope of linear fitting	
●	14.6×10^{-4}
■	7.54×10^{-4}
▲	2.30×10^{-4}

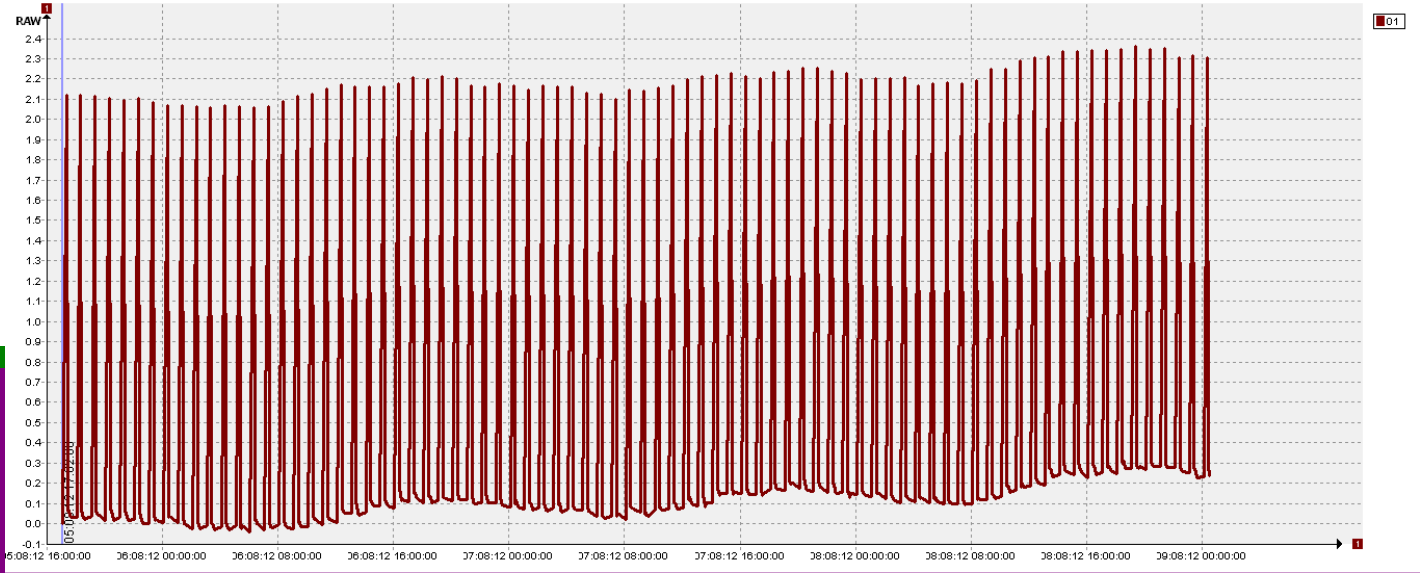
Instrument under test

Concept
Fill tank
Use base to liberate
Ammonia from water
Generate headspace
Measure
Drain
Repeat

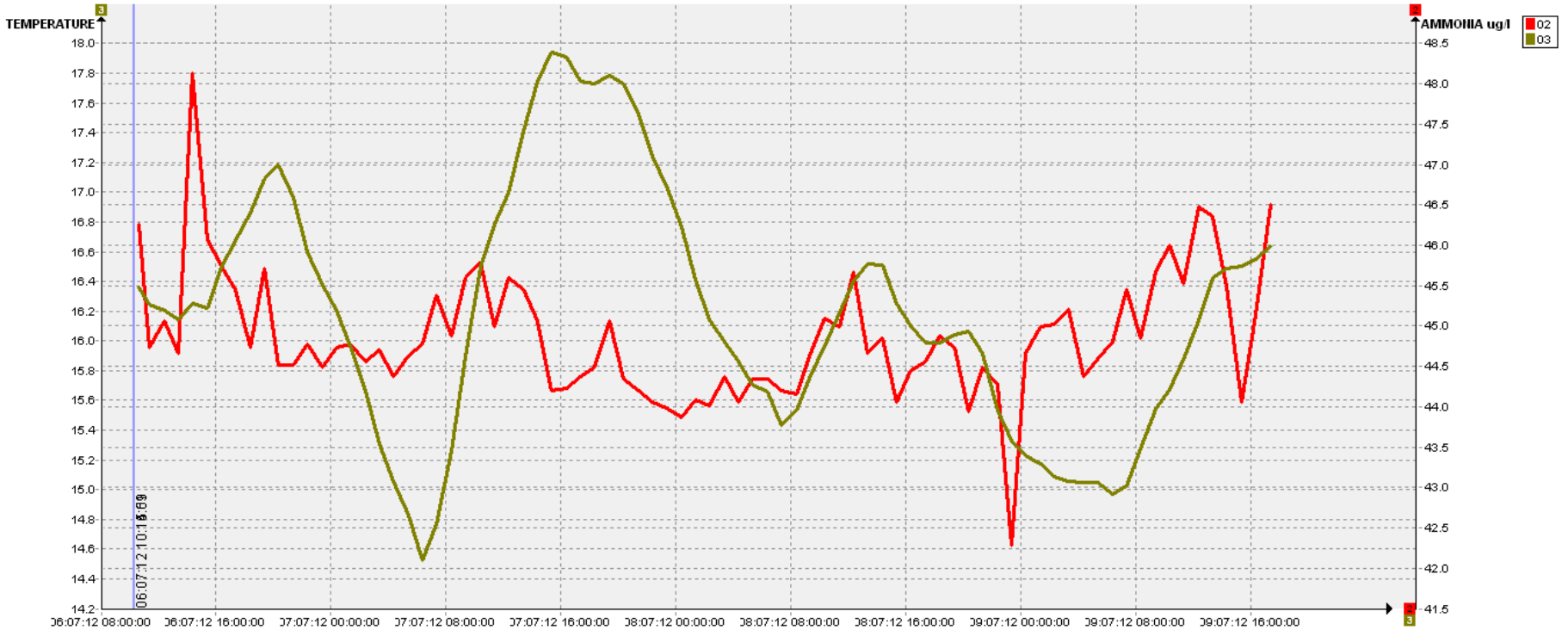
NONINVASIVE

Raw data





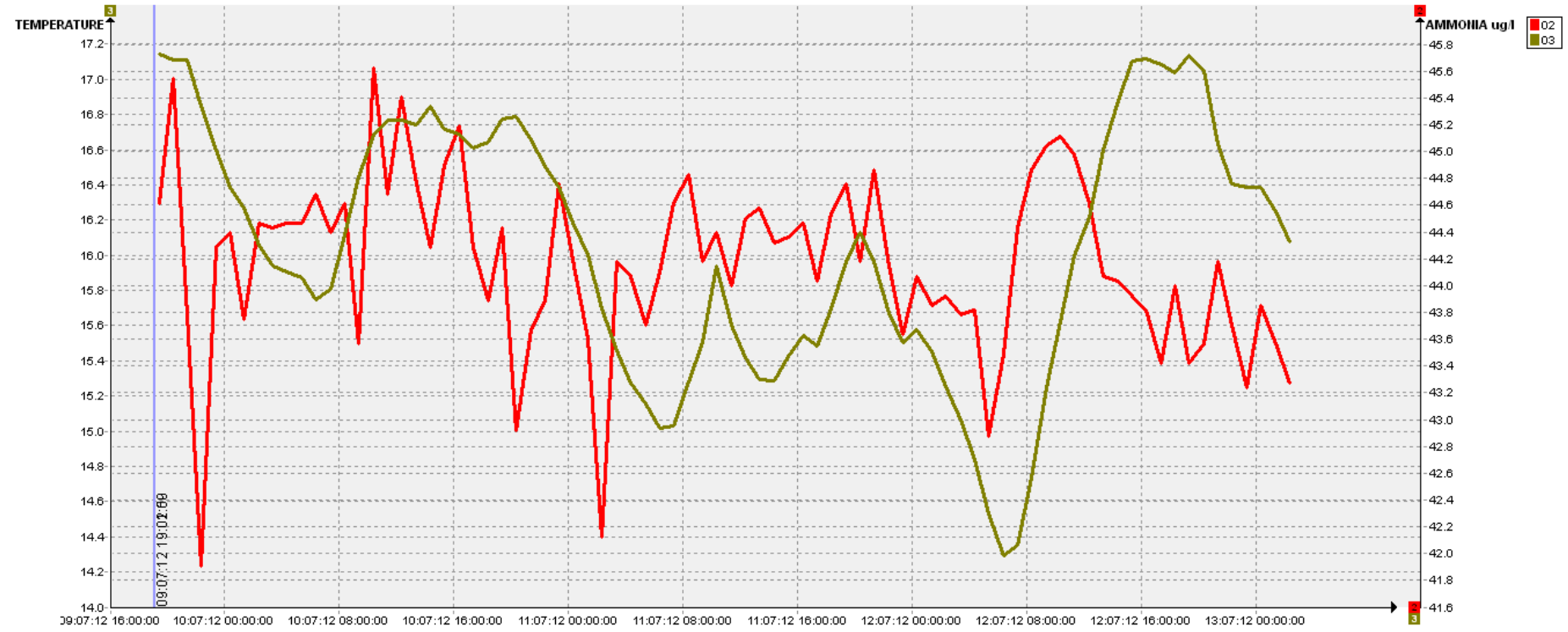
Ammonia and temperature



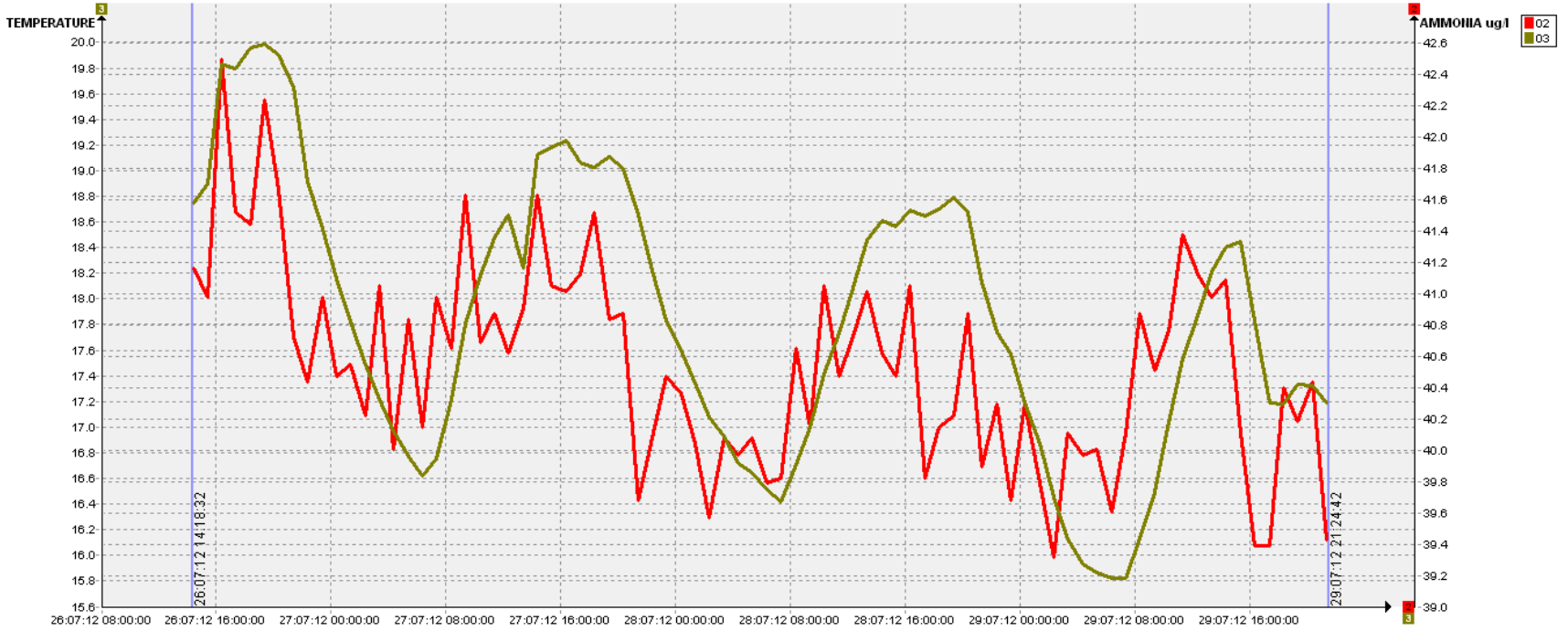
6th July 2012 1030

9th July 2012 1218

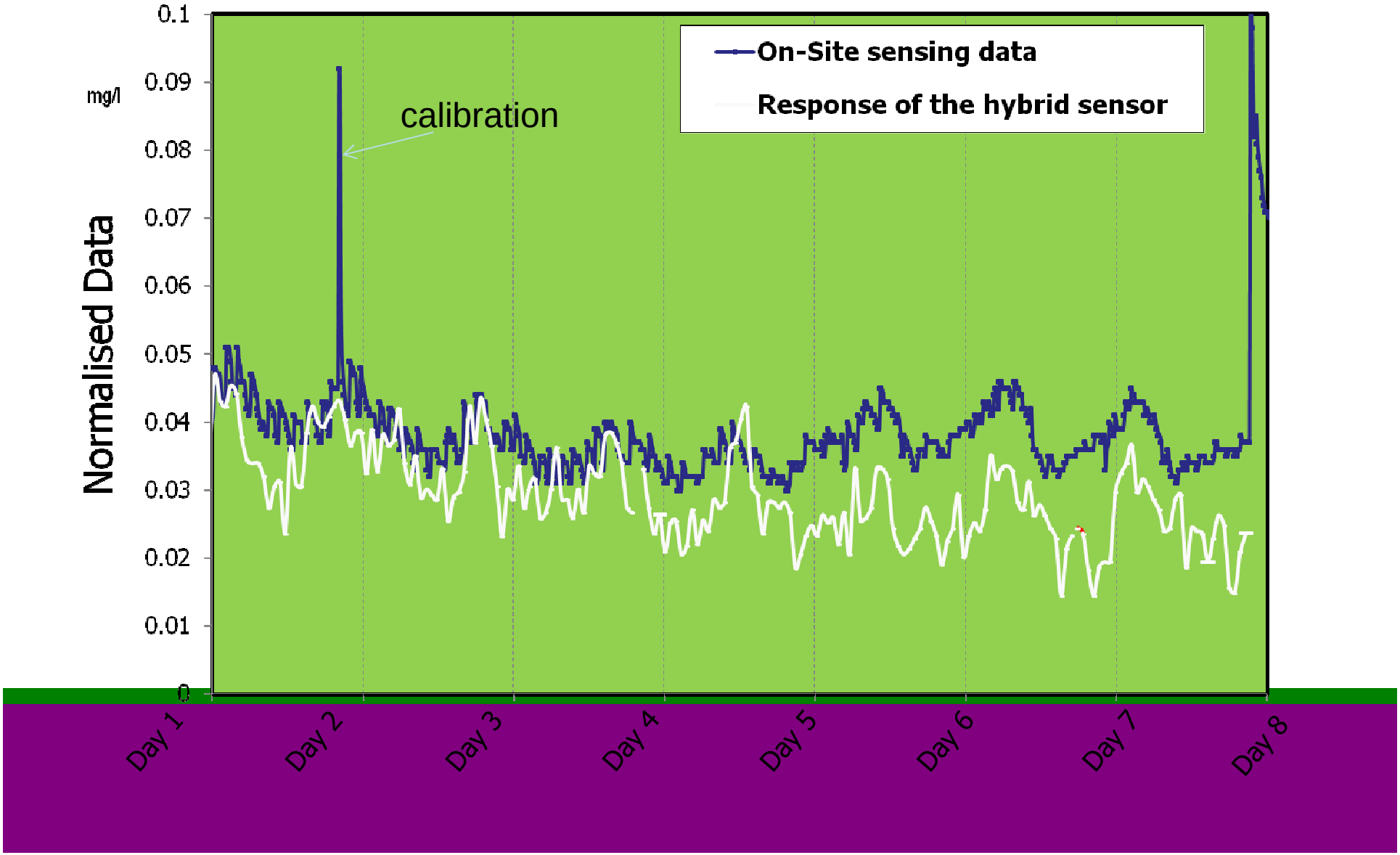
9/7/2012 1909 – 13/7/2012 0220



26/07/2012 1418-29/7/2012 2125



Field test results



Conclusions

- We have created a noncontact instrument for measuring traces of ammonia
- This is applicable to both waste water and clean water applications as well as air quality monitoring
- Significant savings in terms of cost and maintenance