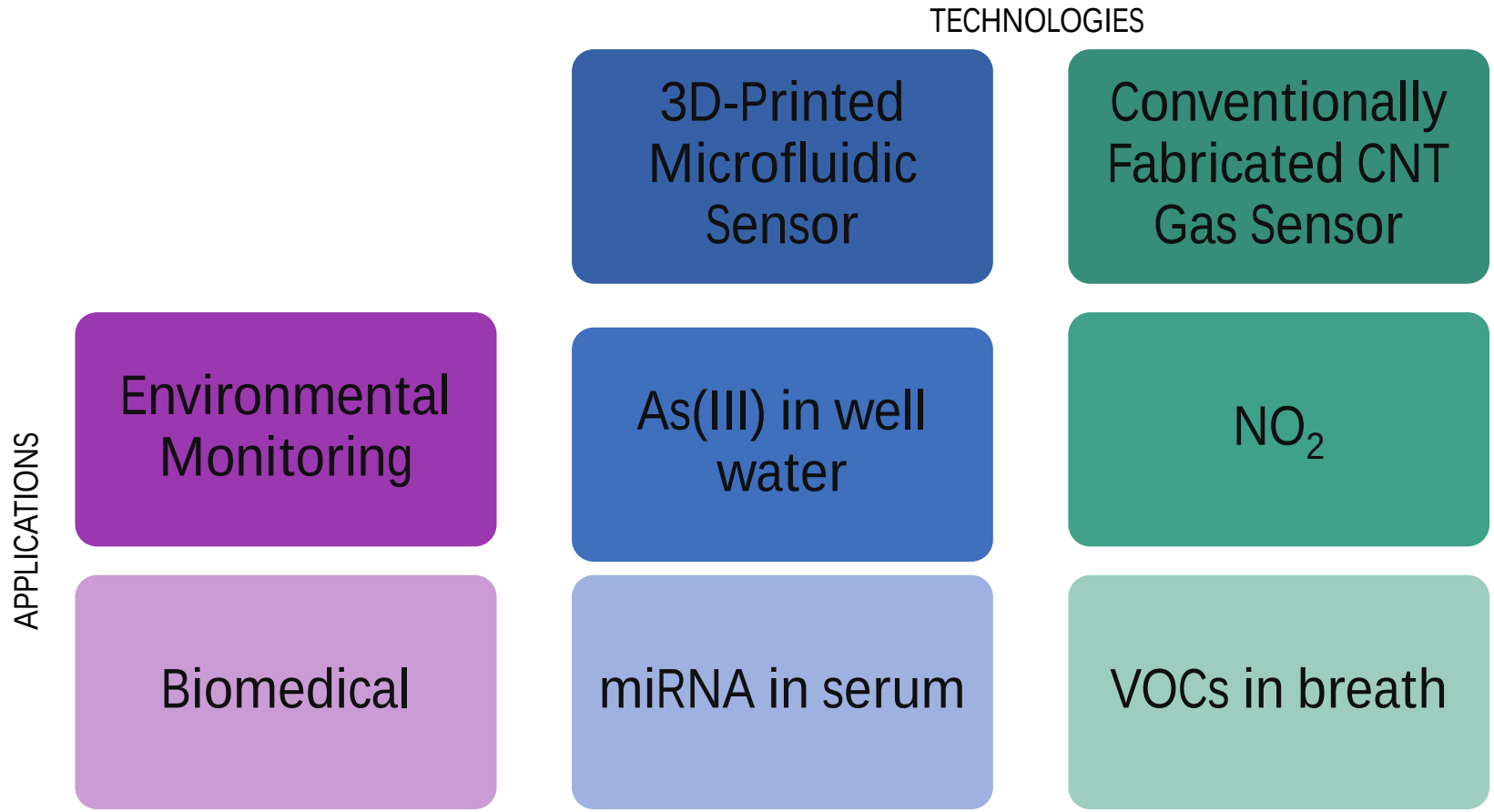
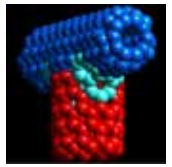
Scrimmage Overview



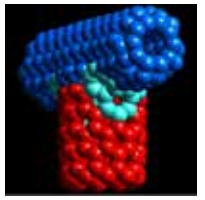
Ames Research Center

What Do We Expect from a Well-Designed Chemical Sensor System?



- First, a single device has no value. We need a system consisting of:
  - Sensor array (Electronic Nose with pattern recognition…)
  - Pre-concentrator?
  - Sample delivery, Microfan? Jet?
  - Signal processing chip
  - Readout unit (data acquisition, storage)
  - Interface control I/O
  - Integration of the above (nano-micro-macro)
- Criteria for Selection/Performance
  - Sensitivity (ppm to ppb as needed)
  - Absolute selective discrimination
  - Small package (size, mass)
  - Low power consumption
  - Rugged, reliable
  - Preferably, a technology that is adaptable to different platforms
  - Amenable for sensor network or sensor web when needed

Challenges for Nano Chemsensors



- Most of the literature just focuses on material response to exposure of a given gas; rarely on selectivity, effects of interferants and other practical aspects.
- Long term stability? Reliability? Life time? Sensor-to-sensor variation?
- Impact of nanomaterial quality on reproducibility (serious problem with CNTs).
- Sensor refreshing when performance diminishes? How ? How often ?
- Construction of sensor arrays as e-nose.
- Breath sensors => humidity domination! Serious interference with signal, how to filter out humidity without also losing the analytes of interest?
- Large scale fabrication
    - 'Pick and play' approaches, aligning NTs/NWs won't work
    - *In situ* CVD? Unlikely on a large wafer
    - Need to be able to deliver multiple materials to multiple sensor elements in an array on a wafer which contains numerous sensor chips
- End to end fabrication, Supply Chain Management

Factors to Consider

- Primary Discussion Points
  - Factors impacting the reproducibility of the manufacturing method and final product
  - Factors to consider when choosing materials (e.g., cost, purity, source)
  - The plan for testing, including field/test conditions, regulatory requirements, scope, etc.
- Other Considerations
  - Factors impacting the scalability of the manufacturing method
  - Limitations in terms of raw materials and processing technologies
  - Manufacturing cost drivers for this technology
  - Remaining technical issues hindering commercialization of this technology
  - Factors that will influence the decision to manufacture in-house vs. contracting out
  - Life-cycle considerations (e.g., device or effluent disposal)
  - Major safety concerns for manufacturing the sensor
  - Other (please specify)