KWJ ENGINEERING INC
INNOVATIVE SOLUTIONS FOR GAS DETECTION

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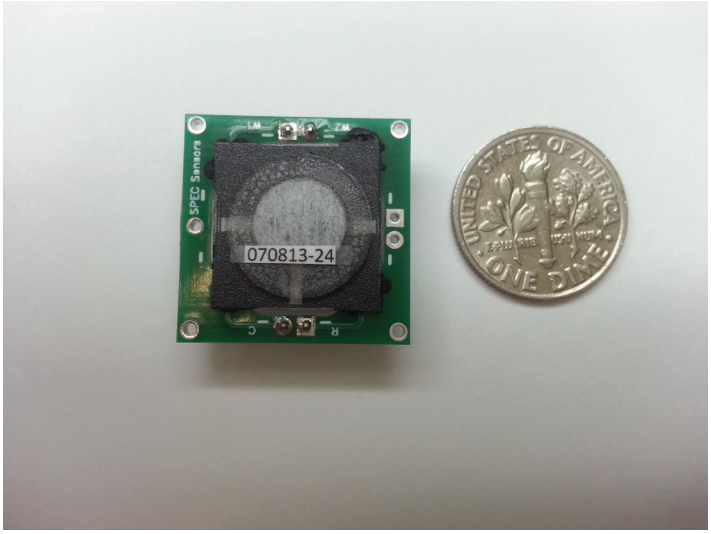
A New Low Cost Ammonia Sensor for Environmental Health Monitoring
NIH Phase I: 1R43ES019385-01



Need: In this SBIR program, KWJ Engineering Inc. began development of a new, ultra low-cost amperometric sensor for the detection and quantification of ammonia (NH3), with improved cost-performance characteristics compared to currently available sensors. Atmospheric NH3 is a respiratory irritant and health risk for people with respiratory conditions as well as a major source of PM2.5 components. We demonstrated a new, low cost, high performance NH3 sensor, which supports the NIEHS mission to "...reduce the burden of human disease and dysfunction from environmental causes...". The new technology we will broadly support the mission of NIEHS by ready adaptability to a wide variety of oxidizable or reducible toxic gases, including CO, SO2, NO2 , O3, NO and HCN. Commercial NH3 sensors are one of more poorly performing types, so there is need for performance improvement. The extremely low cost and flexibility of the proposed sensors will enable a new microscale technology for detecting and quantifying, simultaneously, multiple environmental exposure agents, which can be use in wearable formats as well as more conventional approaches.

Approach/Results. The Phase I program involved design and fabrication of the new, printed amperometric sensor platform and incorporation of selected room temperature ionic liquid (RTIL) electrolytes. Effective electrode materials and RTILs for NH3 monitoring were identified. The sensors were characterized for typical performance characteristics and benchmarked against currently available commercial NH3 sensor. The tiny developmental RTIL-based printed sensor was found to competitive with commercial offerings in many performance respects, even in unoptimized Phase I form.

Benefits/Innovation: We continue the development of the printed ammonia sensor and to develop field prototypes for validation in wearable and distributed wireless formats. Ultimately, this sensor is to be incorporated into KWJ's growing array of printed sensor products. This development represents the opportunity to develop relatively unexplored science in the challenge of NH3 sensing and to couple this with a new, technologically innovative sensors to solve critical problems related to environmental public health. The economic potential of a new, much less expensive toxic gas sensor that bridges the cost-performance gap between instruments and monitors is also significant.