NSF SPONSORED NOx SENSOR RESEARCH FOR DIESEL COMBUSTION EXHAUST MONITORING

ABSTRACT

Multicore Photonics proposed a concept for a new way to quantify important components of diesel exhaust (NOx, carbon monoxide, ammonia slip) to the NSF (National Science Foundation) in June of 2015. Dieselgate occurred in September of that same year, and before 2015 was gone we were notified of an NSF Phase I award to begin development. The initial research effort sufficiently proved the concept for our “artificial taste bud” thermo-catalytic approach to measuring the concentration of unknown reactive gases in an exhaust stream, and my company was later awarded an NSF Phase II grant for the same topic. After 2 more years of research and the winding down of our Phase II program, 2019 greets us with engagements with two major engine/automobile manufacturers, and the commercial introduction of the first fundamentally new way to measure NOx in diesel exhaust since Bosch presented their oxygen sensor-based product approximately 20 years ago.

Multicore Photonics will present the results from our first-generation NOx sensor as well as follow-on sensor generations with data collected both in the laboratory and on a diesel truck hosted on a dynamometer undergoing commonly employed emission test cycles. Sensor response times, accuracy, and detection limits were determined and will be presented. A machine learning algorithm was used to fit the nonlinear data collected to accurately predict NOx concentrations illustrating how even our pre-commercial prototypes outperformed commercially available NOx sensors in key areas. Finally, we will briefly discuss our future plans, as well as present additional concepts for leveraging our unique sensor technology to expand the use case for inexpensive yet robust measurement of problematic gases of concern today.