UVM Innovations
The University of Vermont Office of Technology Commercialization

Instrumentation – Environment

Case # 389

Ultrafine Particle Detector Allows In-Situ Engine Exhaust Monitoring

Competitive Advantages

- ☑ Small, vibration-resistant detector quantifies submicron particles.
- ☑ Modular system can be installed in large fleets of vehicles at low cost.
- ☑ Sensor unit is easily removed for analysis, cleaning, or replacement.
- ☑ Useful for research, manufacturing, and repair facilities.

The submicron particles in engine exhaust are known to adversely affect human health. Capable of penetrating the alveolar-capillary barrier and evading the body's natural defenses, they are deposited in lung tissues and transported through the bloodstream. This may lead to serious or fatal conditions such as asthma and inflammatory diseases.

Currently available ultrafine particle detectors are large, expensive, sensitive to vibration, and not designed for in situ measurement.

The First Onboard Detector

Now a small, inexpensive detector, powered by a 12 Volt source and resistant to the effects of vibration, can be installed in a small car or other vehicle.

Cost-Effective Design

The modular system consists of a corona ionizer that negatively charges the particles and repels them toward a flexible printed circuit board. This component can be easily removed for chemical analysis, cleaning, or replacement.

Post-collection, off-board signal processing mitigates on-board processing requirements, allowing the size and cost of the detector to be minimized.

Large fleets of cars equipped with the detectors would provide a large data set for research. In addition, the technology could be used for stationary or on-board vehicle diagnostics, as well as manufacturer testing of forthcoming engine designs.

Next Steps

Further circuit board design, programming, and mechanical packaging will be completed. Then electrical and pneumatic testing will be conducted on a prototype unit.

Commercialization

Anticipated end-users include university and government research labs, businesses and municipalities needing to test their fleet vehicles, automobile manufacturers, state vehicle inspection departments, and automotive repair facilities.

Patent/Licensing Status

Patent pending. Exclusive rights available.

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