

A Hybrid Vehicle Mounted Membrane Inlet Mass Spectrometer for Spatial Analysis of Atmospheric Chemical Concerns

Guido F. Verbeck¹, Phillip M. Mach¹, Ethan McBride¹, Kenneth C. Wright²

¹*University of North Texas, Denton, TX;* ²*Inficon Inc., East Syracuse, NY*

Vehicular emplacement of a rack mounted membrane inlet mass spectrometer enables concurrent mobile sampling and attribution of a GPS location to each spectrum. The system is capable of spatial mapping and quantitation of chemical interests, with plotting functionality through Google Earth. The operator has the ability to use electric only locomotion, preventing any exhaust from traditional internal combustion. Removing any interferences from exhaust permits close proximity sampling in areas of interest, without any chance of contamination. The system is powered by on board batteries with approximately 25 miles of drivable active sampling. Data collection is managed by open source microcontrollers and Python code.

Recently, the system has been deployed to the Eagle Ford region for field analysis of oil and gas production. Active fracking sites were sampled with detection of BTEX and PAHs. Further analysis via heat mapping of data localized sources of these chemical constituents and attributed effluent to be originating from flaring activities. Further application of this mobile platform involved the detection of clandestine manufacture of methamphetamine. A mock manufacture was setup and impurities of the synthetic process were introduced into the atmosphere via heating. Subsequent detection of precursors and byproducts allowed for localization of this site via spatial mapping of data. Incorporating the EPA's ALOHA software allows for theoretical predictions of effluent plumes, accounting for ambient conditions such as wind direction and temperature. Further development will include enhanced real time data and feedback to operators