



Application Note: Trace Analysis by Jet-REMPI



OPOTEK Inc, makers of tunable OPO laser systems, has been developing a compact portable instrument for the detection of trace aromatic vapors using jet-REMPI technology. The instrument we develop is a highly-sensitive, real-time device for the detection of a variety of species with high chemical sensitivity. By providing rapid measurements of process contaminants, this instrument will yield timely information for process optimization resulting increased yields. With a target detection limit of ~100 ppt for a wide variety of vapors, including most common aromatic solvents, the system will be able to provide highly sensitive monitoring of trace contaminants in the clean-room environment.

Unlike competitive techniques such as gas chromatography, the jet-REMPI instrument will not need lengthy sample pre-concentration and separation in order to provide this level of performance. Detection sensitivities in the 100 ppt range can be obtained within seconds directly from ambient air. The system can also rapidly switch between detecting different species within seconds to provide real-time monitoring of multiple contaminants with using a single instrument.

The chemical selectivity of this technique allows analysis of complex mixtures of compounds without the need to perform any prior chemical separation. Our preliminary performance results show that even for isomers, a >100:1 rejection ratio can be obtained when contaminants are present, even at the low level detection limits. This allows precise quantification of each chemical process, and precise identification of contaminants. Preliminary studies have shown performance in the low **100 ppt range** for a variety of common solvent vapors, including **benzene, toluene, ethylbenzene, chlorobenzene and xylenes**. The technology is adaptable to a wide variety of vapor species with significant UV absorption features, including single- and multi-ring aromatics, substituted aromatics, highly-conjugated alkenes, and other vapor species such as mercury. OPOTEK is currently in the process of assessing system performance with a broader variety of such compounds.

A preliminary design of a portable system resulted in the following system specifications: The entire unit will measure 18"(W)x 25"(D)x38"(H) and weight about 200 lbs, will be entirely air cooled, and require only 110V 15A electrical service. The small package size and limited external requirements make this type of system ideal for many portable measurements that can take advantage of jet-REMPI's unique real-time performance capabilities.