

## THE ADVANTAGES OF FTIR SPECTROSCOPY FOR GAS ANALYSES

There are a multitude of analytical techniques that can be applied to gas analyses; so what differentiates FTIR spectroscopy from its most frequent competitors: NDIR, EP-IR, MS, GC, and CRDS. Much can be written about the pros and cons of each of these methods, but for purposes of this writing only one or two specific features will be cited; and these comments will be constrained to real-time, high-sensitivity applications of impurities in the electronic specialty gases and to combustion gas applications.

FTIR combined with long path gas cells offers simultaneous fast-time response (in seconds) of multiple gas species over a broad pressure range at ppb/ppm concentrations; it can not detect the homopolar diatomic or monatomic species.

EP-IR combined with long path gas cells offers faster time-response (in tenths to hundredths of a second) of gas species in severe environments of noise and vibration; the number of simultaneous species is limited by the spectral range of the specific EP-IR.

NDIR combined with a gas cell offers ppm measurements of single gas species for which a strong absorption peak can be selected with an IR filter; it is limited by the requirement of a separate instrument for each gas species, each of which has to be calibrated for the specific species.

MS offers identification of all gas species in a complex mixture by their ionization fragmentation patterns; it requires gas sampling at low pressures and cannot handle corrosive gases.

GC offers physicochemical separation of gas species at ppm concentrations and can be designed for fast time response of single species; it requires an absorption column and detector which match the species to be monitored.

CRDS offers very fast time response at ppt/ppb concentrations of single gas species per instrument; it is limited to gas species for which an absorption line matches an available laser frequency.

While all of these techniques have advantages and disadvantages, a user requiring gas analyses can select whichever method best matches his or her application. Nevertheless, FTIR spectroscopy is broadly used because of its applicability to multiple species, fast time response, ppb sensitivity, temperature and pressure ranges, and corrosive gases.