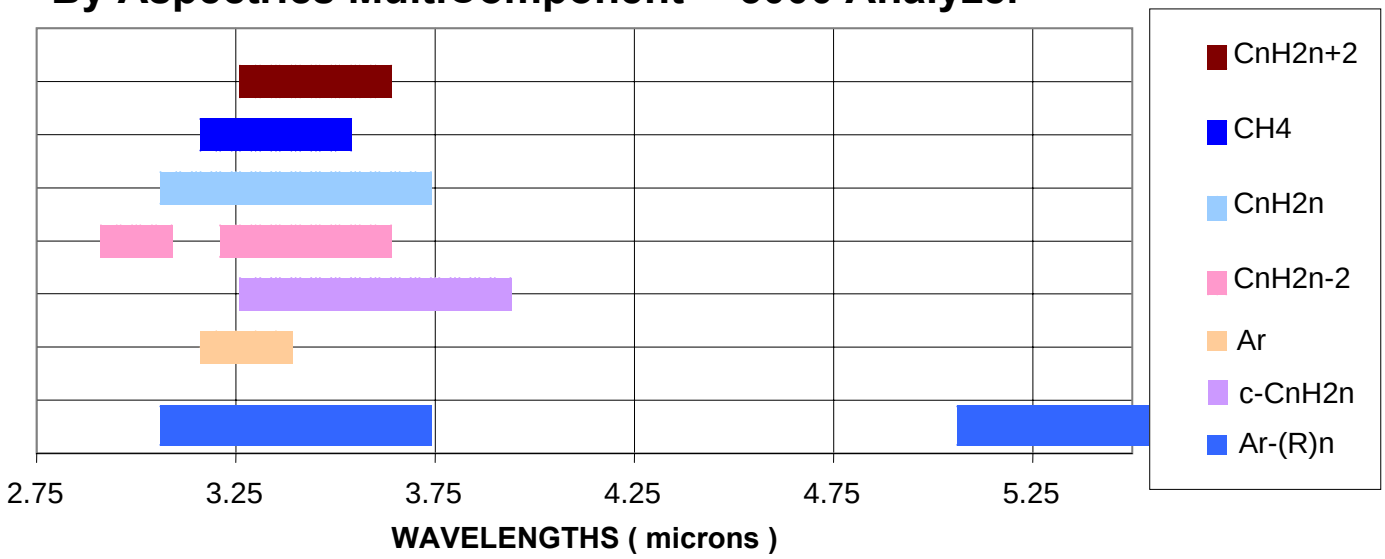
Gas Phase Levels Of Detection of Hydrocarbons Using Aspectrics MultiComponent™ 5000 Analyzer and I-Cell dedicated sampling accessory.

SUMMARY: ***when dealing with the quantitative analysis of IR-absorbing chemicals in gas phase, an ever-present question is that of the limit of detection of the method.***

The spectral covered by current EP-IR spectrometers is ideal for the measurement of the highly IR absorbing hydrocarbon family, including saturated and unsaturated, chain, branched, and cyclics, and aromatics, whether substituted or not.

This technical note reports, based upon the experimental determination of photometric noise of EP-IR spectrometers coupled to a dedicated 2.0 meter multi-pass I-Cell gas sampling accessory and known IR absorptivities of chemical compounds, theoretical levels of detection as a function of time.

Hydrocarbon Species Selectively Observed By Aspectrics MultiComponent™ 5000 Analyzer



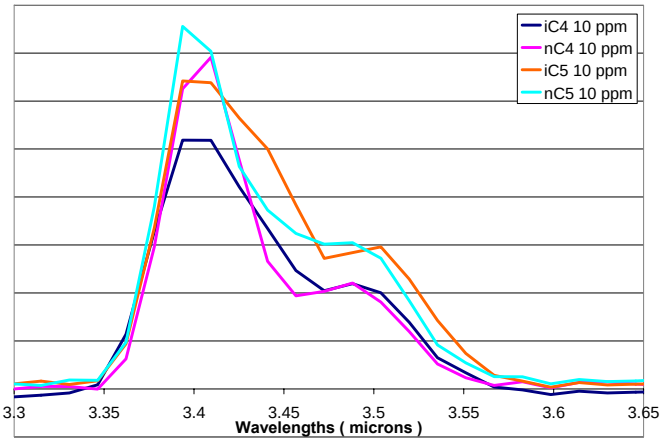
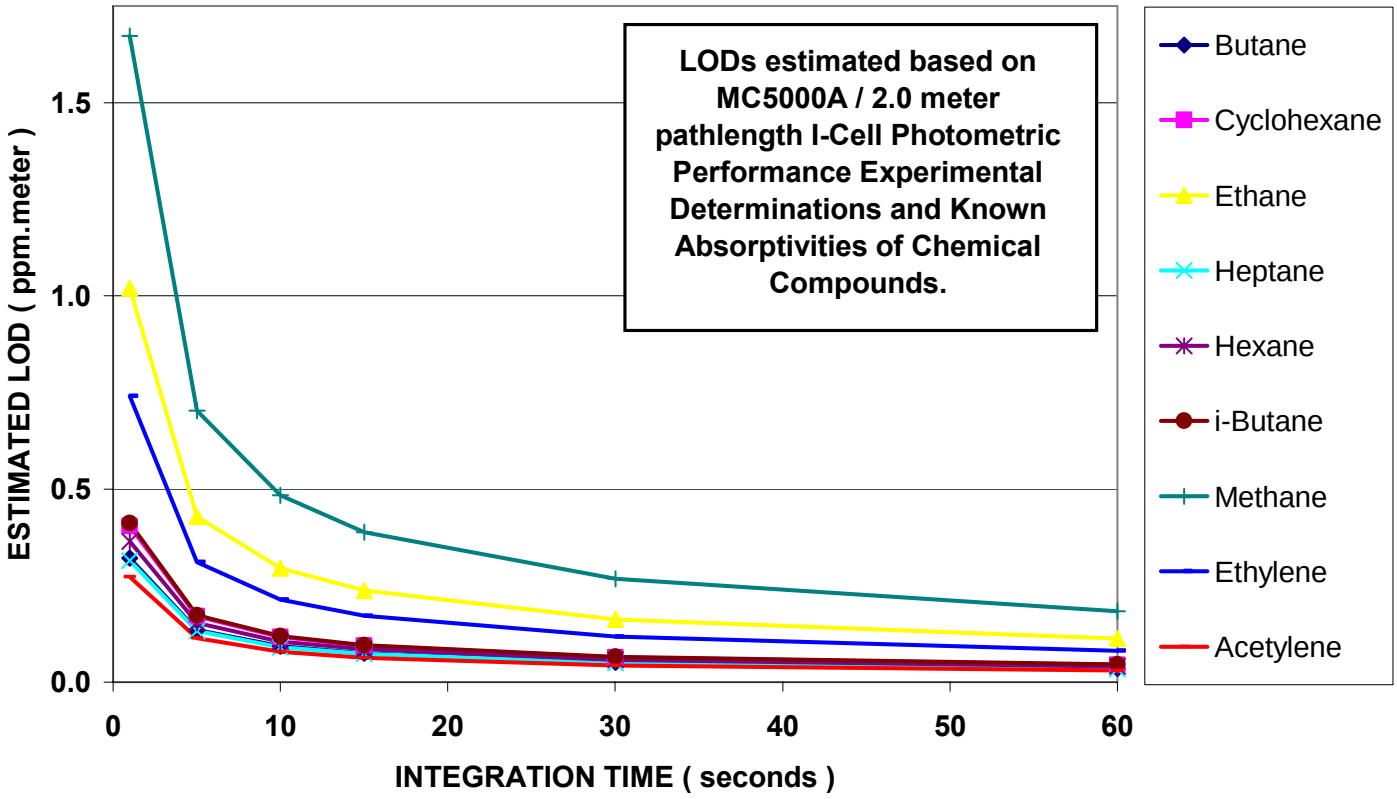


fig 1 (left): Overlapped Spectra of n-butane (nC_4), 2-methyl propane (iC_4), n-pentane (nC_5), and 2-methyl butane (iC_5)

Table 1 (below): cross-sensitivity between 4 spectrally overlapping hydrocarbon homologs.

Interferent		Cross Sensitivity of chemical to interferent					
nC4	100 ppm	iC4	-0.5%	nC5	+0.5	iC5	0.6%
iC4	100 ppm	nC4	+0.5%	nC5	-0.4%	iC5	+0.5%
nC5	100 ppm	nC4	-0.6%	iC4	-0.1%	iC5	-0.3%
iC5	100 ppm	nC4	-0.5%	iC4	-0.5%	nC5	+0.6%

Estimated LODs - Hydocarbon Compounds



		CH4	C2H6	C3H8	iC4	nC4	iC5	nC5
	Absorptivity (ppm.meter)	7.35	4.48	2.19	1.81	1.41	1.52	1.30
Theoretical LOD (ppb) MultiComponent 5000 Analyzer and 2.0 m I-Cell	1 sec integration	1103	672	329	272	212	228	195
	5 sec integration	461	281	137	114	88	95	82
	10 sec integration	317	193	94	78	61	65	56
	15 sec integration	254	155	76	63	49	53	45
	30 sec integration	175	106	52	43	33	36	31
	60 sec integration	120	73	36	30	23	25	21

IMPORTANT - **Some of these theoretical values have been confirmed experimentally (See Aspectrics Tech Note 060622A):**

- **Methane: experimental LODs measured between 65 and 76 ppb (1σ @ 60-sec / 3.2 m pathlength)**
- **Ethane: experimental LODs measured between 34 and 70 ppb (1σ @ 60-sec / 3.2 m pathlength)**
- **Iso-pentane: experimental LODs measured between 8 and 17 ppb(1σ @ 60-sec / 3.2 m pathlength)**

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