

APPLICATION NOTE

LD16-08



Measurement of hydrocarbons in UHP Oxygen using the MultiDetek 2 and PlasmaDetek-E



▲ MultiDetek2

▲ PlasmaDetek2

This application note shows different methods that have been developed by LDetek for measuring the hydrocarbons in a stream of Oxygen (other matrixes can be analysed as well since the PlasmaDetek-E is strictly selective to hydrocarbons). This application note is the continuity of the application note LD16-02. It is then suggested to first read the LD16-02 to be advised about the technology that was used.

LDETEK SOLUTION:

The chromatograms shown in figure 1 and in figure 3 have been performed using a single column with a Plasmadetek-E. The system uses nitrogen as a unique carrier gas. The simplicity of this configuration makes this solution very efficient and simple for operation. No maintenance is required for such micro plasma based system.

Method for chromatogram in figure 1:

The MultiDetek2 configuration uses a 10 port diaphragm valve mounted in an injection/backflush mode. The sample gas is then introduced in the packed porous polymer type column for eluting the Air/O₂ followed by CH₄ in one direction to the detector before to reverse the flow in the column to get the NMHC redirected to the detector. The selective mode of the PlasmaDetek-E makes the detector being strictly selective to hydrocarbons and makes oxygen/air being invisible to the detector. The detector response and LDLs are demonstrated in figure 2. Please note that different performances can be achieved depending on the maximum and minimum ranges required.

Method for chromatogram in figure 3:

Using the same valve configuration combined with a different column type and system conditions, the analysis of separated C₂'s becomes possible. For some applications, where it is critical to measure C₂s individually, especially acetylene at low concentrations, this method is preferred. The addition of C₃+ measurement can be done in the same system to cover the whole hydrocarbon analysis solution. It offers better accuracy, sensitivity and simplicity than conventional FID or Argon plasma method. Figures 4-5 and 6 show an example of performances using this method in real life conditions.

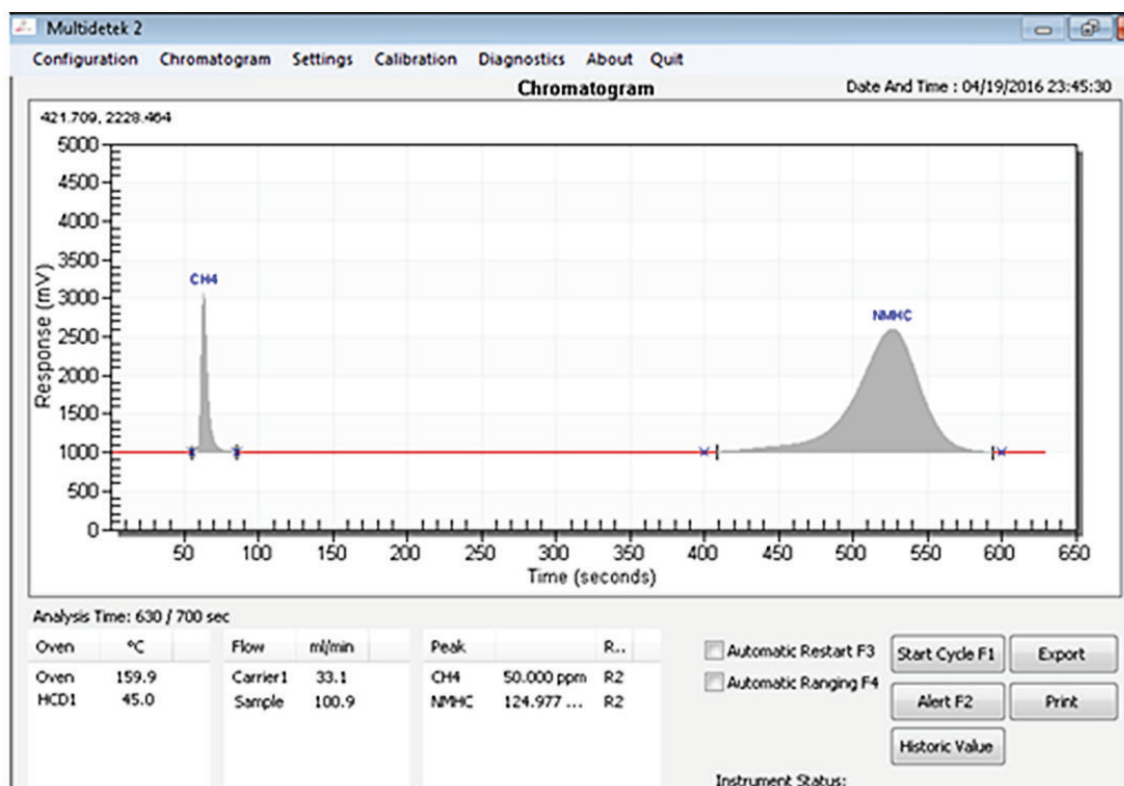


Figure 1: Chromatogram of CH₄ & NMHC in oxygen matrix

COMPONENT	CONCENTRATION	PEAK HEIGHT	NOISE	LDL (3X NOISE)
CH ₄	50.000 ppm	2211 mV	0.8 mV	0.054 ppm
NMHC	124.977 ppm	1622 mV	0.4 mV	0.092 ppm

Note: other LDL could be obtained with different injection volume and chromatographic condition

Figure 2

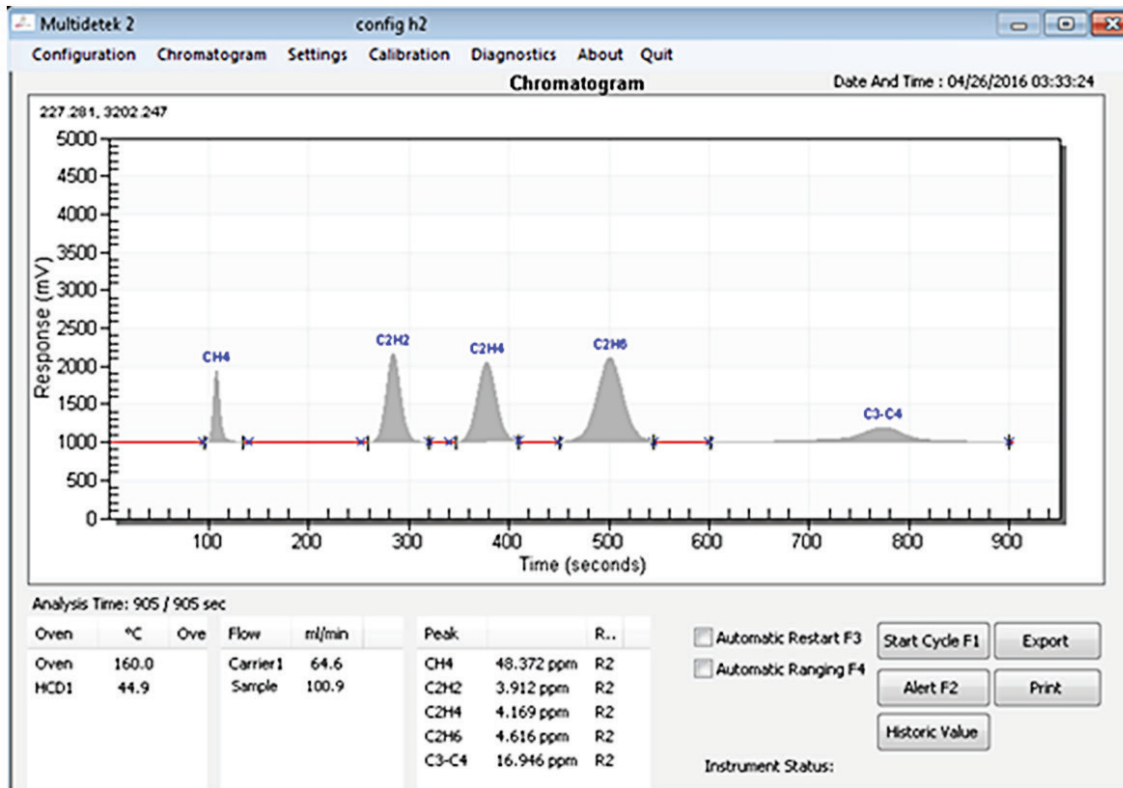


Figure 3: Chromatogram of trace CH₄, C₂H₂, C₂H₄, C₂H₆ & C₃+ in oxygen matrix

COMPONENT	CONCENTRATION	PEAK HEIGHT	NOISE	LDL (3X NOISE)
CH ₄	48.372 ppm	951 mV	0.3 mV	0.046 ppm
C ₂ H ₂	3.912 ppm	1241 mV	3.3 mV	0.031 ppm
C ₂ H ₄	4.169 ppm	1111 mV	3.3 mV	0.037 ppm
C ₂ H ₆	4.616 ppm	1146 mV	3.3 mV	0.040 ppm
C ₃ +	16.946 ppm	220 mV	0.9 mV	0.207 ppm

Note: other LDL could be obtained with different injection volume and chromatographic condition

Figure 4

Historic Values

ne	CH4	C2H2	C2H4	C2H6	C3+
/2016 04:23:29	7.278	7.368	7.252	6.947	23.382
/2016 04:08:18	7.283	7.365	7.250	6.947	23.383
/2016 03:53:07	7.281	7.364	7.253	6.955	23.397
/2016 03:37:56	7.282	7.361	7.246	6.942	23.387
/2016 03:22:45	7.289	7.362	7.253	6.954	23.409
/2016 03:07:34	7.290	7.368	7.254	6.965	23.422
/2016 02:52:23	7.280	7.369	7.259	6.968	23.428
/2016 02:37:12	7.265	7.369	7.260	6.960	23.419
/2016 02:22:01	7.278	7.377	7.266	6.965	23.419
/2016 02:06:50	7.293	7.379	7.264	6.960	23.406
/2016 01:51:39	7.275	7.382	7.269	6.951	23.417
/2016 01:36:28	7.276	7.385	7.266	6.965	23.420
/2016 01:21:17	7.290	7.390	7.268	6.980	23.424
/2016 01:06:06	7.288	7.390	7.273	6.983	23.453

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Figure 5: Example of stability results over 10 consecutive cycles

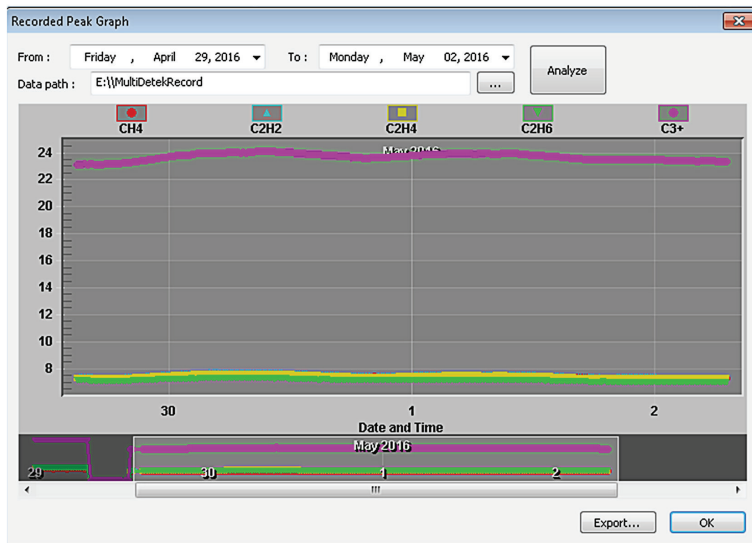


Figure 6: Example of stability results over a 3 day period

CONCLUSION:

The use of the PlasmaDetek-E in a compact MultiDetek2 gas chromatograph using nitrogen as carrier makes the hydrocarbon analysis being very simple compared to the other existing methods. Other variants of hydrocarbon combination, plus other impurities like CO₂-N₂O... can be measured with the use of this micro plasma based selective detection technique and the versatile MultiDetek2 design.



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