

APPLICATION NOTE

LD12-7

Analysis of Neon-Hydrogen-Argon-Krypton-Nitrogen with the PlasmaDetek & the HSR-Etek column

The analysis of Neon, Hydrogen, Argon, Krypton and Nitrogen by chromatography has always been problematic. The bad separation and the poor sensitivity for the analysis of these impurities are the reasons that make it complicated to realize. Even with the use of capillary columns, cryogenic system and/or hydrogen trapping system, the analysis of low ppb of these impurities cannot be performed in one run. Furthermore, the detectors available in the industry have some sensitivity limitation. It is then very difficult to measure low ppb for the mentioned impurities especially for Neon with the existing technologies.

LDetek has then developed a method for the analysis of Neon, Hydrogen, Argon, Krypton and Nitrogen. Using the PlasmaDetek system and the HSR-Etek column, the low ppb analysis without any interference can be successfully realized using a simple injection.

> PLASMADETEK SYSTEM

The PlasmaDetek can be configured in a non selective or in a selective mode depending of the lowest detection limit requested and the interference gases. Using its selective mode, the response ratio between the analyte of interest and the interference gases will be increased. The detector can then be very sensitive to the Neon, Hydrogen, Argon, Krypton and Nitrogen without being affected by background gases or interference gases.

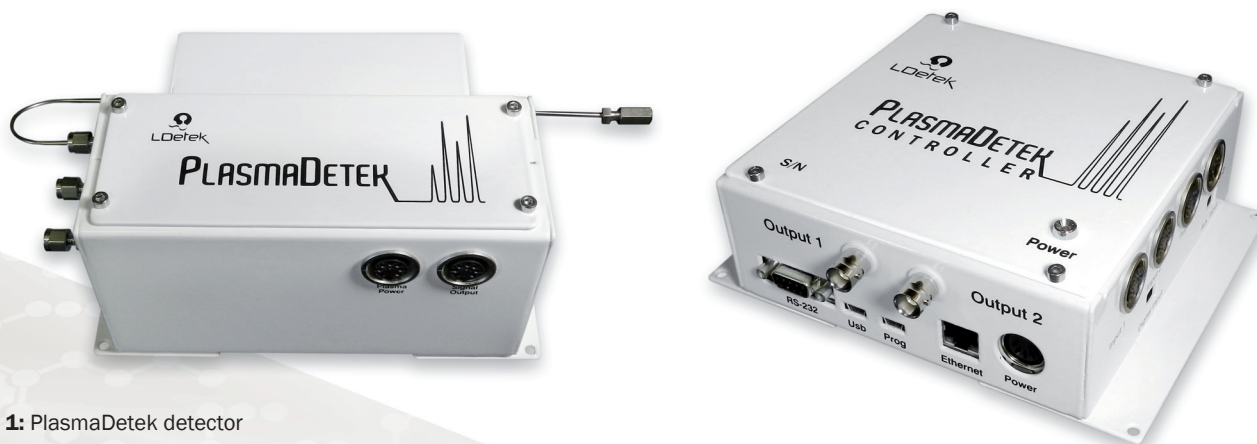


Figure 1: PlasmaDetek detector

This is a stand-alone detector system that requires only helium or argon carrier gas to make the measurement. No need of doping gas or other devices. By using argon as carrier gas, the analysis of neon and argon cannot be realized.

> CHROMATOGRAPHY CONFIGURATION

This measurement is done by using a simple injection (see figure 2)). The sample is injected through the HSR-Etek column and then goes directly to the PlasmaDetek inlet port. The carrier flow rate must be regulated at 30sccm and maintained stable. The column temperature must operate at 45Celcius until minute 4. The column temperature is then ramped up to 90Celcius at 10Celcius/minute. Using the temperature ramping mode, the analysis of Krypton and Nitrogen can be included in less than 16 minutes.

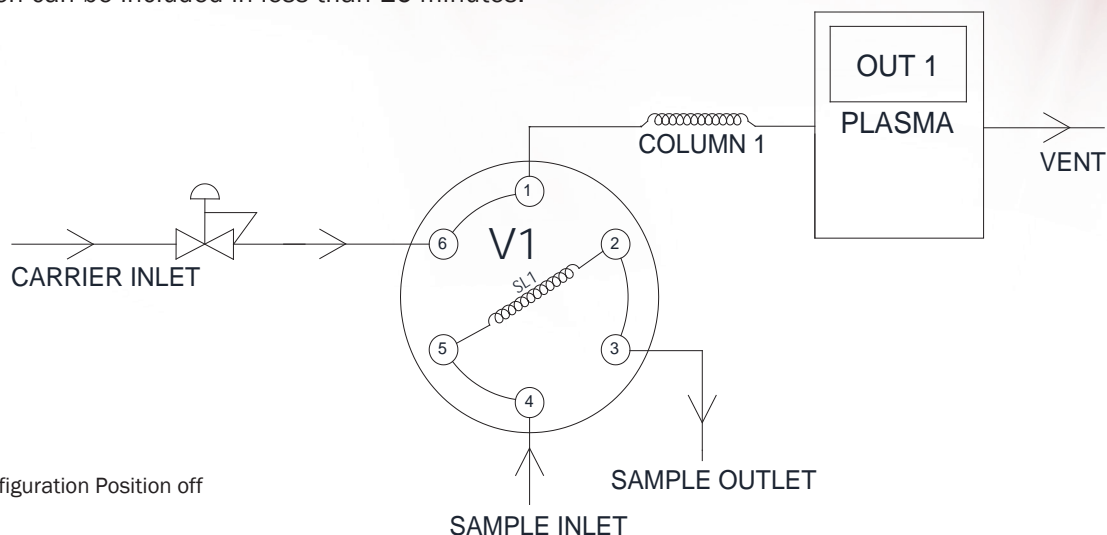


Figure 2: Configuration Position off

> RESULTS AND PERFORMANCE

Figure 3 shows the chromatogram obtained from this configuration.

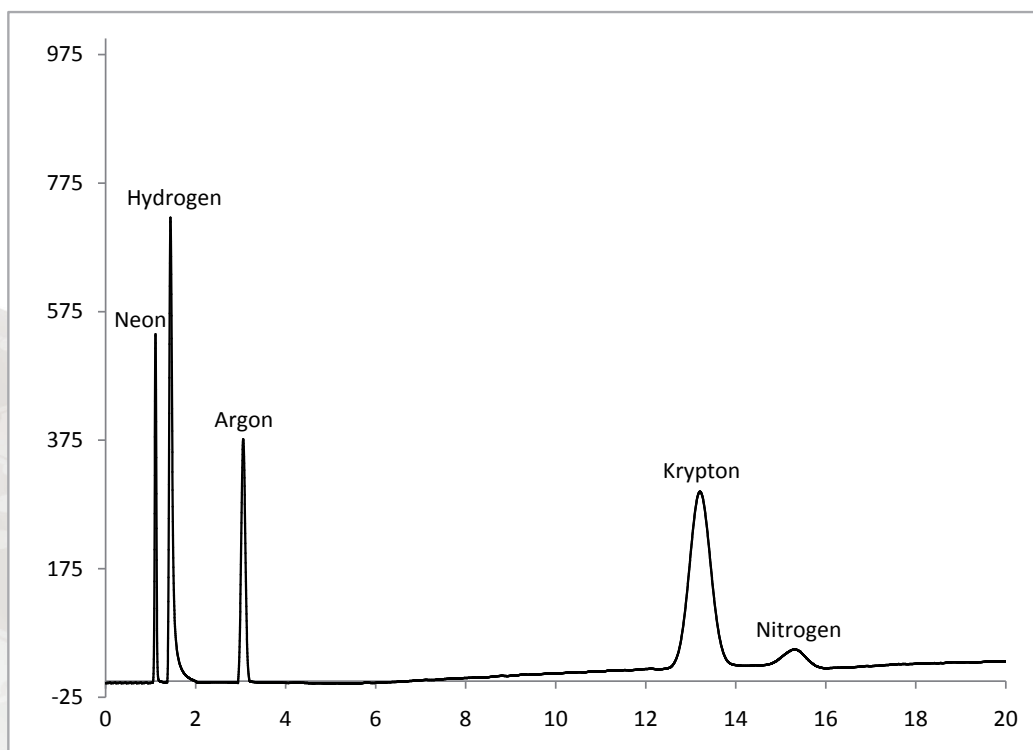


Figure 3:
Mixture 4ppm Neon,
5ppm Hydrogen,
1ppm Argon,
4ppm Krypton,
0.5ppm Nitrogen
in balance Helium

Figure 4 shows the performance of the system obtained with the configuration described above. The PlasmaDetek and HSR-Etek combination gives the possibility to achieve low ppb limit of detection with good resolution for Neon/Hydrogen, Argon/Oxygen and Krypton/Nitrogen using a simple injection. Higher concentration, up to %, can be also measured with the same system.

Component	Concentration (ppm)	Peak Height	Noise	S/N	LOD (ppb) S/N=3	LOQ (ppb) S/N=5
Neon	4	562	0.049	11469	1.04	1.74
Hydrogen	5	756	0.049	15428	0.97	1.62
Argon	1	381	0.049	7775	0.39	0.64
Krypton	4	341	0.049	6959	1.72	2.87
Nitrogen	0.5	38	0.022	1727	0.86	1.45

Figure 4: LOQ and LOD calculation

> PLASMADETEK SELECTIVITY

Using its selectivity, the PlasmaDetek gives the advantage of being very sensitive to desired impurities only. See below an example of analysis of 2ppm Krypton and 4ppm Nitrogen in a balance of Oxygen using HSR-Etek column.

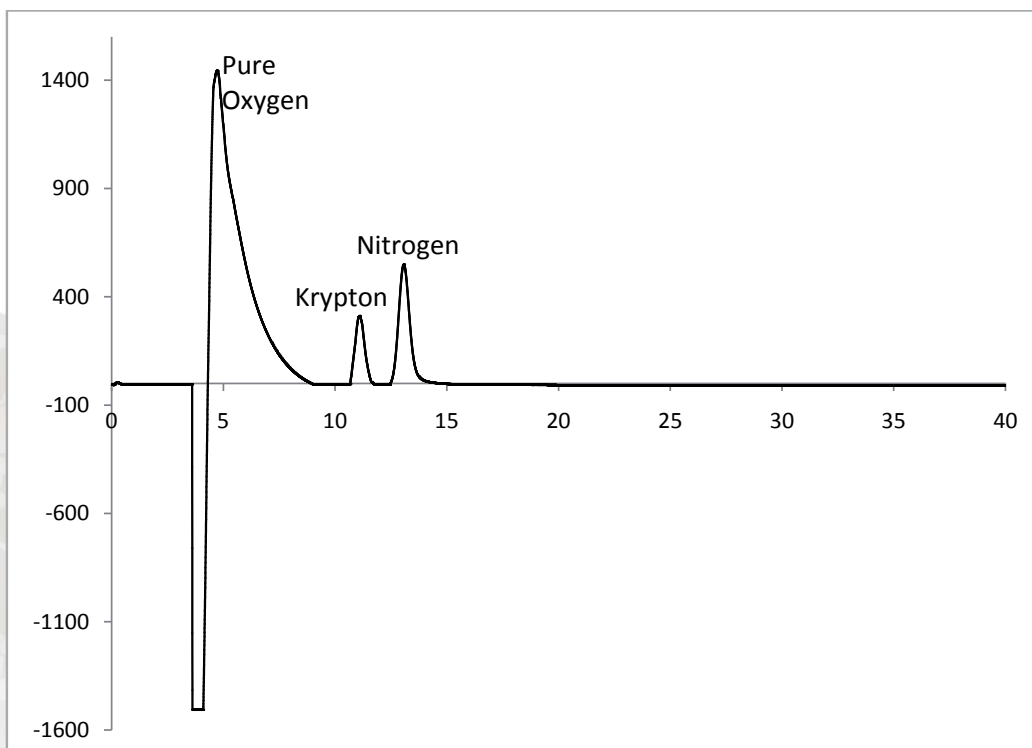


Figure 5:
Mixture 2ppm Krypton,
4ppm Nitrogen
in balance Oxygen

> CONCLUSION

Using the combination of the PlasmaDetek and the HSR-Etek column, the analysis of Neon, Hydrogen, Argon, Krypton and Nitrogen becomes an easy task. A simple injection through the HSR-Etek column and to the PlasmaDetek allow to measure ppb, ppm or percentage level of the mentioned compounds. This is a cost effective, maintenance free system and quick analysis technique avoiding consumables and regeneration procedures that will reduce complexity of the chromatography system.



LDetek

Where innovation leads to success!

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