

APPLICATION NOTE

LD12-3

Analysis of argon in pure oxygen with the PlasmaDetek and ArgoTek

The complexity of measuring argon as impurity in chromatography comes from the fact that typical columns on the market do not separate argon and oxygen. Both elute at the same time making the analysis difficult in low concentration. There are typical techniques for this measurement:

- Using an oxygen trap which involves regeneration procedure with H₂ supply, maintenance, consumable and complex chromatography system.
- Cryogenic configuration where columns need to be used in cold environment which involves complex manipulation.
- Using an online oxygen analyzer in parallel and subtract the oxygen from the measurement of Ar+O₂. But this requires a second analyzer and it is difficult to get an accurate measurement in low concentration.

But the combination of the PlasmaDetek and the ArgoTek column is the ideal solution to measure argon in ppt to %.

> PLASMADETEK CONFIGURATION

The PlasmaDetek is configured with one output signal to be selective to argon. The detector system becomes more sensitive to argon than oxygen by at least a factor of 10.

This is a stand-alone detector system that requires only helium carrier gas to make the measurement. No need of doping gas or other devices to make it selective to argon against oxygen.



Figure 1:
PlasmaDetek detector

> CHROMATOGRAPHY CONFIGURATION

This measurement is done by using a simple backflush to vent configuration. The ArgoTek (column 1) is used to separate the argon from oxygen. The argon comes out first of the column and it is sent to the detector. When the argon is out of the ArgoTek, we simply flush outside the oxygen.

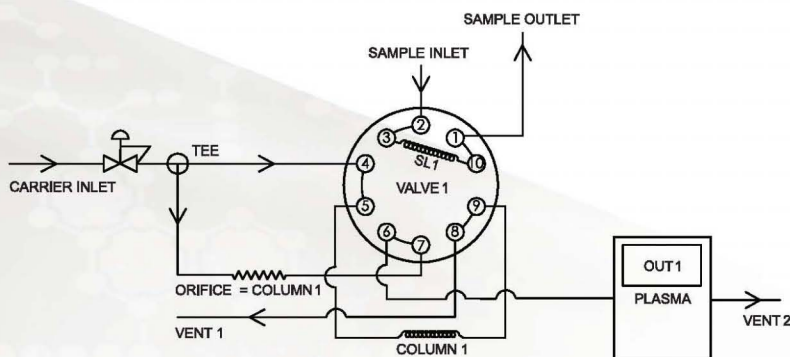


Figure 2:
Plumbing configuration
for argon in pure oxygen

- One PlasmaDetek selective to Argon
- Helium carrier gas: 30 cc/min
- 1 x 10 ports diaphragm valve
- 1 x Argotek column
- 1 x sampling loop: 20 µl

> RESULTS AND PERFORMANCE

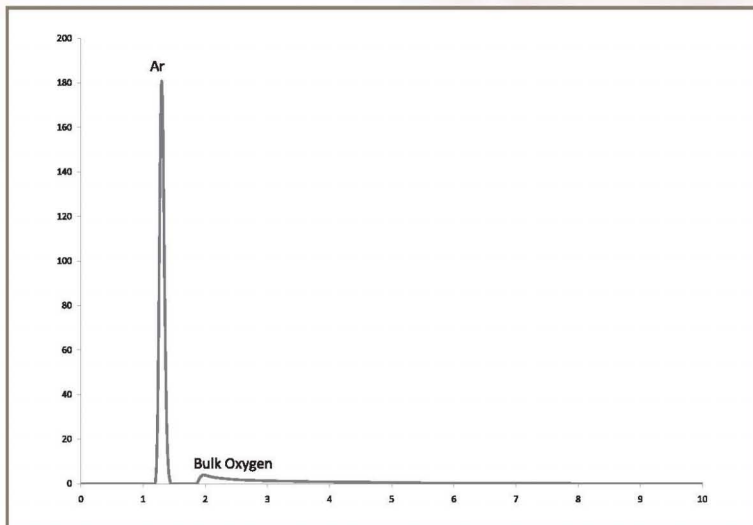


Figure 3: 1 ppm Argon in pure Oxygen

Figure 3 shows the chromatogram obtained from this configuration. The low concentration of argon impurity is easily separated from the oxygen bulk. But more importantly, the selectivity of argon with the detector, gives a better separation of the two compounds, which allows a faster recovery time.

Component	Concentration	Peak Height	Noise	S/N	LOD (ppb) S/N=3	LOQ (ppb) S/N=5
Ar	1	180	0,039	4615	0,65	1

Figure 4: LOQ and LOD calculation

Figure 4 shows the performance of the system obtained with the configuration described above. This PlasmaDetek and ArgoTek combination gives ppt limit of detection with no oxygen interference. Higher concentration, up to %, can be also measured by simply changing the sample volume.

> CONCLUSION

Using the Argotek and PlasmaDetek combination, it becomes very easy to measure this compound compared to other available technologies. This is a cost effective, maintenance free configuration and quick analysis technique avoiding consumables and regeneration procedures that will reduce complexity of the chromatography system.