

... efficient, environmentally friendly, cost effective approach

Overcoming cost and Supply: Let's Use Nitrogen

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Teledyne Tekmar
Purge and Trap (P & T)



PerkinElmer Gas Chromatograph /
Mass Spectrometer (GC/MS)

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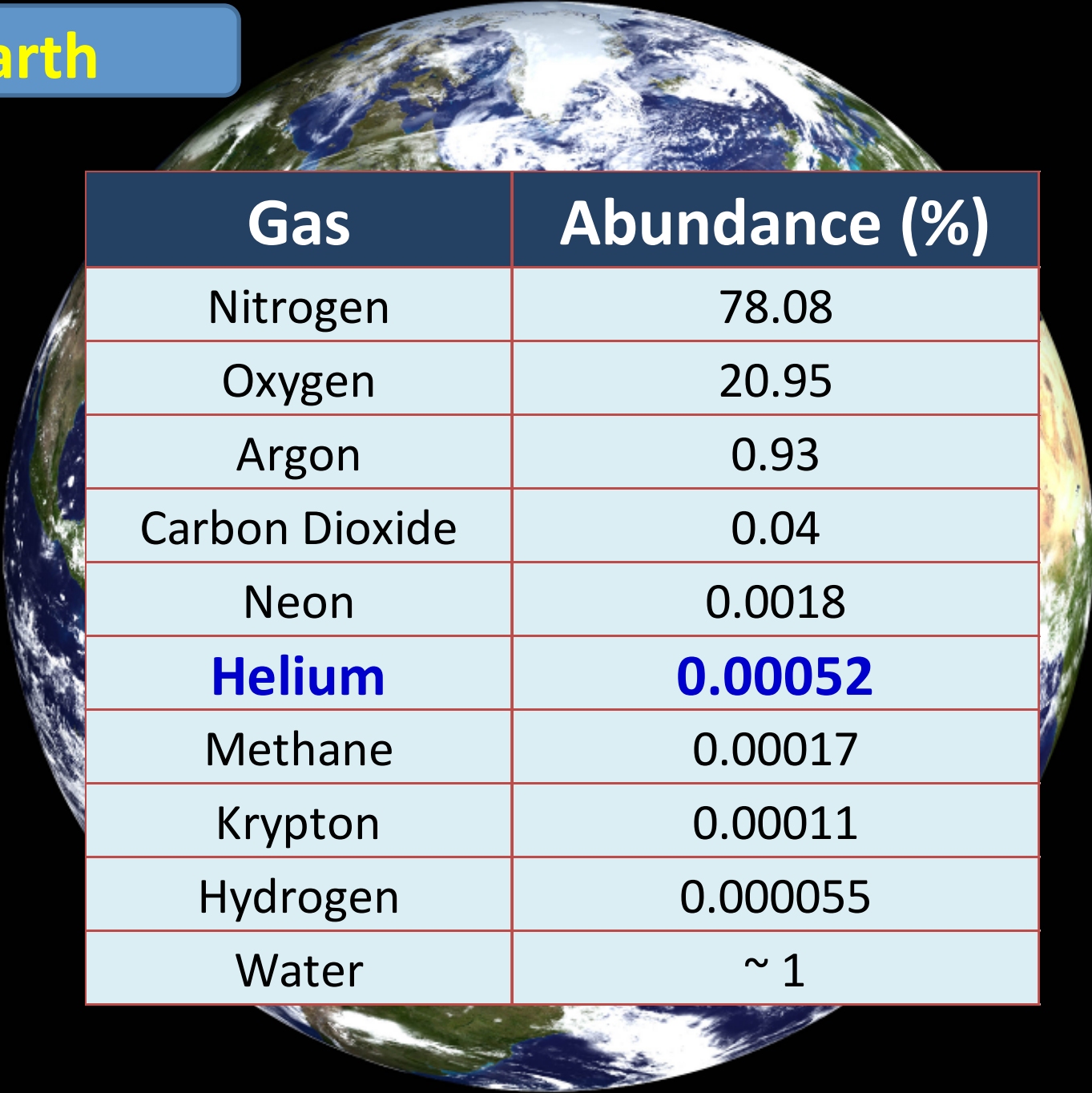
Why?

Supply concern and cost
of helium

Space

Element	Abundance (%)
Hydrogen	73.9
Helium	24
Oxygen	1.07
Carbon	0.46
Neon	0.13
Iron	0.11
Nitrogen	0.1
Silicon	0.07
Magnesium	0.06
Sulfur	4
Others	0.07

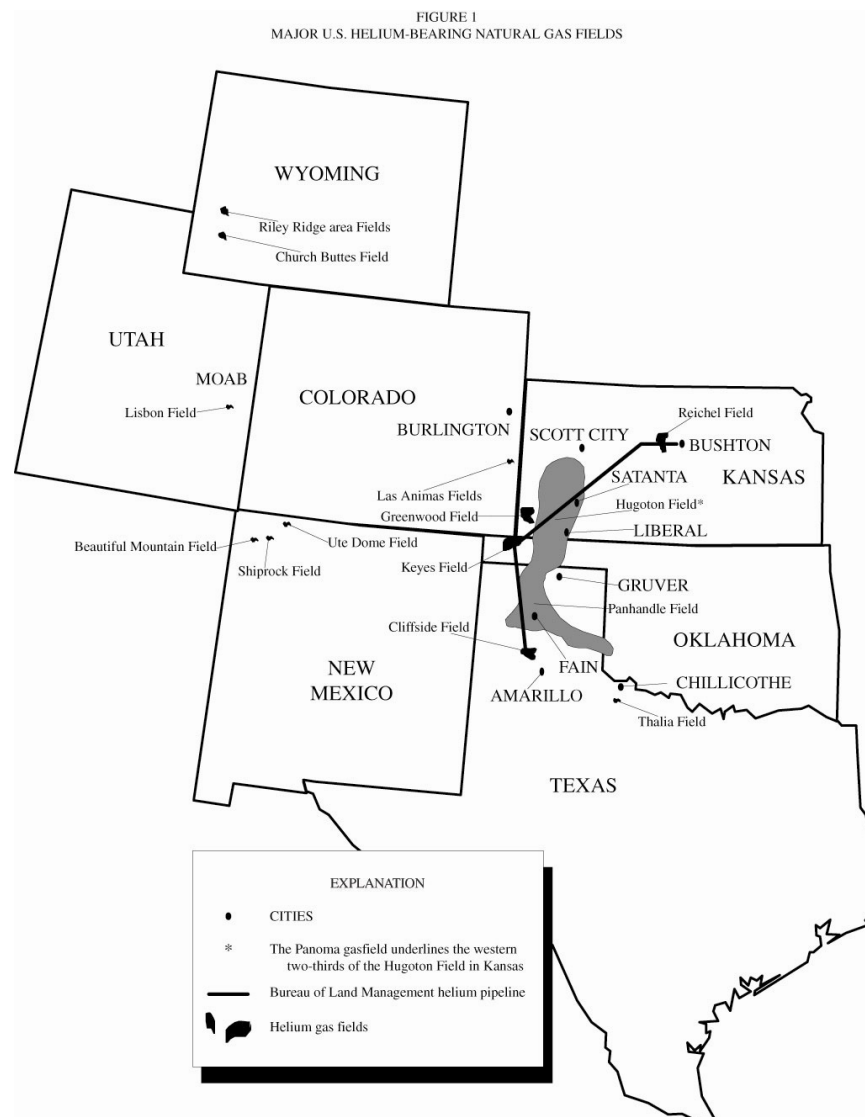
Earth



Gas	Abundance (%)
Nitrogen	78.08
Oxygen	20.95
Argon	0.93
Carbon Dioxide	0.04
Neon	0.0018
Helium	0.00052
Methane	0.00017
Krypton	0.00011
Hydrogen	0.000055
Water	~ 1

Helium Mining

- ▶ USA (83%)
- ▶ Algeria (11%)
- ▶ Canada
- ▶ Poland
- ▶ Russia
- ▶ Qatar



Application	Usage (%)
Lifting	15.1
Magnetic Resonance Imaging (MRI)	15.0
Welding	14.9
Chromatography	7.6
Heat Transfer	6.4
Leak Detection	5.6
Pressurizing	5.5
Fibre Optics	4.1
Diving Mixtures	4.0
Superconductors	2.9
Inert Atmospheres	2.7
Nuclear Magnetic Resonance (NMR)	1.3
Other	14.9

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The question?

Should chromatographers be investigating
alternative suitable carrier gases?

Purpose of Research: Alternative Carrier Gases

- The goal of this research was to investigate the use of alternative carrier gases while meeting method criteria.
- Helium is the referee. Hydrogen and nitrogen were investigated.
- Nitrogen may be our best choice!



Quick Look: He, H₂ and N₂

Parameter	Helium	Hydrogen	Nitrogen
Safety	Safe	Caution	Safe
Source	Cylinder	Cylinder or Generator	Cylinder or Generator
Cost	Expensive	Cost Effective	Cost Effective
Supply	Concern	n/a	n/a
Column choices	Wide to narrow bore	Narrow bore	Narrow bore
Inertness	Inert	Highly Reactive	Inert
BFB/DFTPP	Passes	Passes	Passes

- ▶ **Hydrogen:**
 - Possible protonation
 - 2 to 4 times reduction in response.

- ▶ **Nitrogen:**
 - Chromatography efficiency
 - 15 times reduction in response

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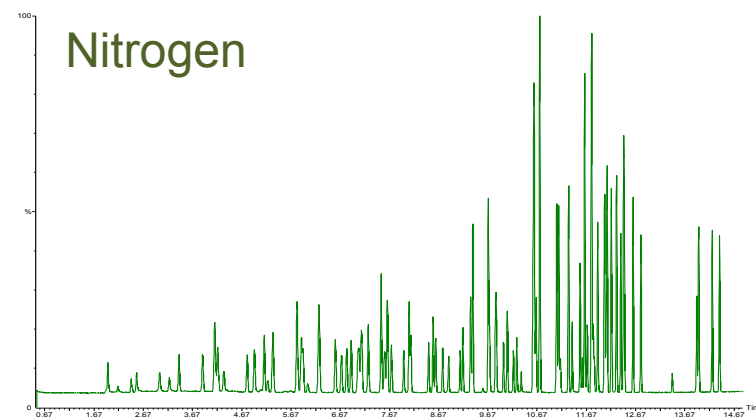


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Summary of Results



- ▶ Met all EPA criteria in nitrogen and hydrogen
- ▶ Peak efficiency is Great!
- ▶ Reporting limits of 0.5 ppb were achieved in all carrier gas
- ▶ Nitrogen, more inert than hydrogen, perhaps the best choice!

Thank you!



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**Looking forward to seeing you
at our poster for discussion and
review of data and research!**

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