

Introducing Green Flash Chromatography, sc-CO₂ Flash



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GreenFlash Chromatography (GFC)

GreenFlash replaces over 80% of the organic solvents currently used for Traditional Flash Chromatography with supercritical carbon dioxide (sc-CO₂)

GreenFlash Benefits :

- Less money spent on costly organic solvents and their disposal
- Improve workflow, speed and quality of separations – Less solvent to evaporate
- Enhanced workplace safety by minimizing the use of toxic, flammable solvents
- Meet demands for greener technologies and regulatory compliance
- Potential for new applications not currently possible with traditional Flash Chromatography

GreenFlash Chromatography with Three Key Innovations

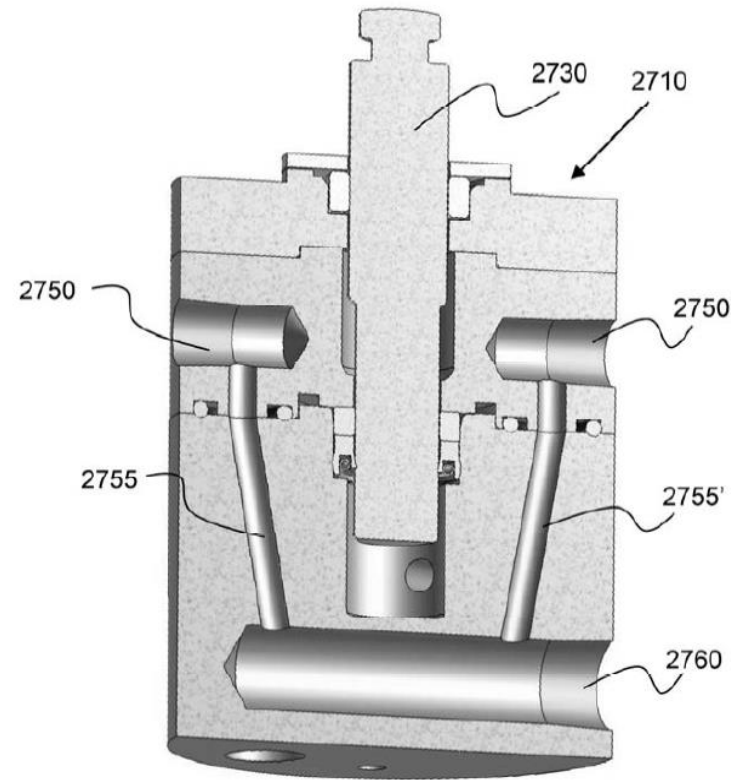
Our Goal was to make the transition from traditional Flash Chromatography to GreenFlash Chromatography as seamless as possible!

Key Technologies:

- Accurate, reliable, pumping of liquid CO₂ utilizing Joule Thompson Expansion to cool CO₂ to bring density to ~1g/ml, an efficient way to pump highly compressible CO₂ with just one pump.
- Pressure Containment Assembly enables the use of pre-packed silica gel in disposable cartridges; The same plastic flash cartridges used in traditional flash systems.
- Gas/Liquid Separator applied for the first time to a Flash Chromatography System; Separated fractions are collected in exactly the same manner as a traditional Flash Chromatography system.

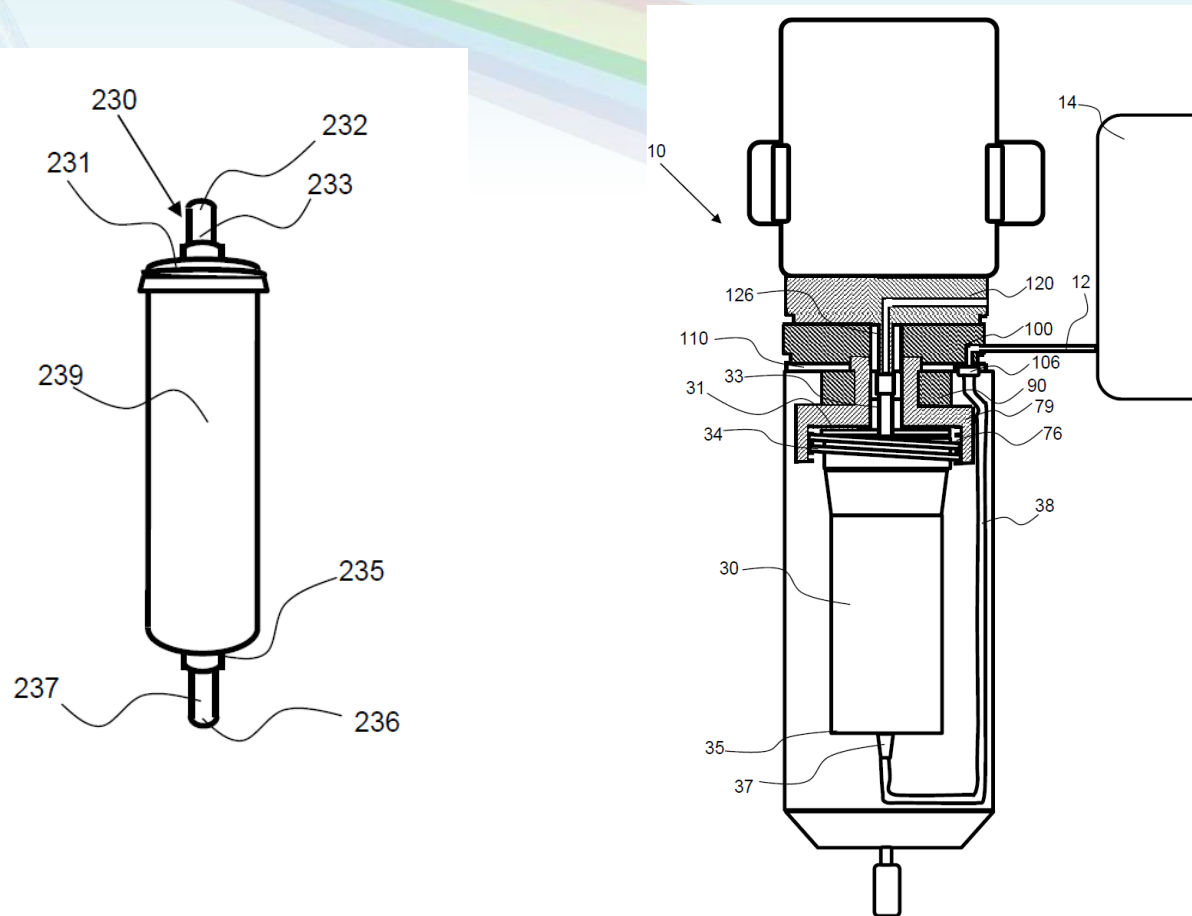
GreenFlash Chromatography (GFC) – The Technology

Joule-Thompson Expansion to cool CO₂ raising the Density to ~1g/ml for efficient pumping



GreenFlash Chromatography (GFC) – The Technology

Pressure Containment Assembly (PCA) to allow the use of traditional disposable flash cartridges



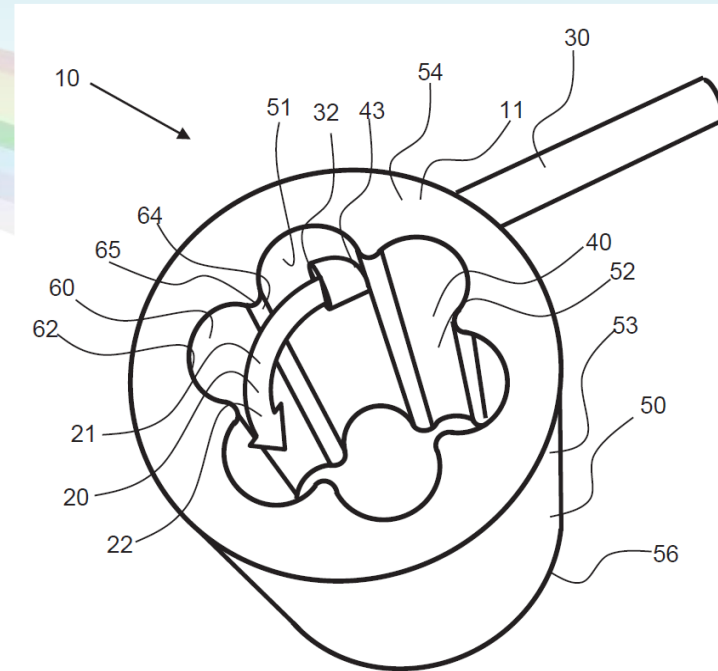
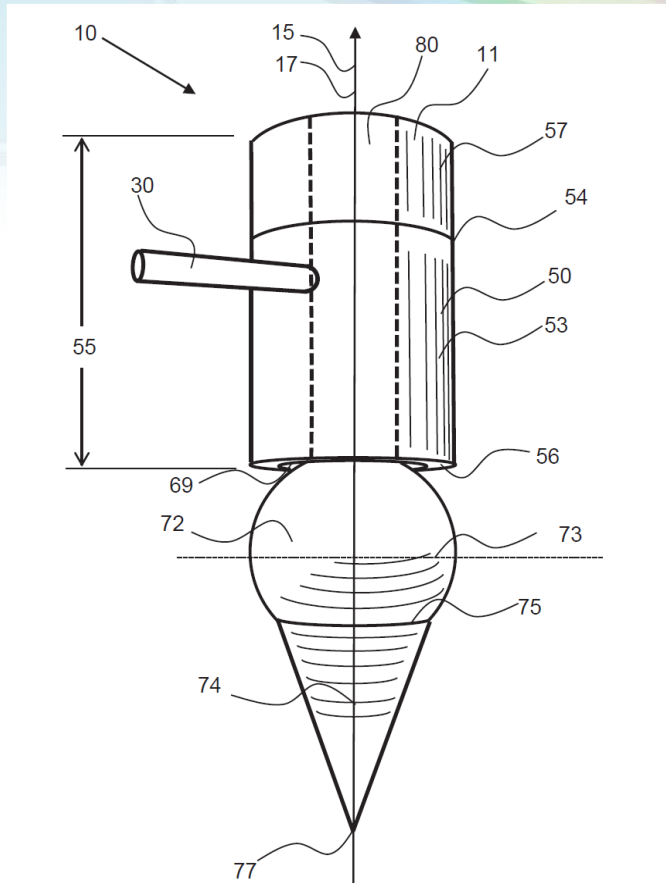
GreenFlash Chromatography (GFC) – The Technology

- Interchangeable Cartridge Fixture for GFC, Simple Loading/Unloading



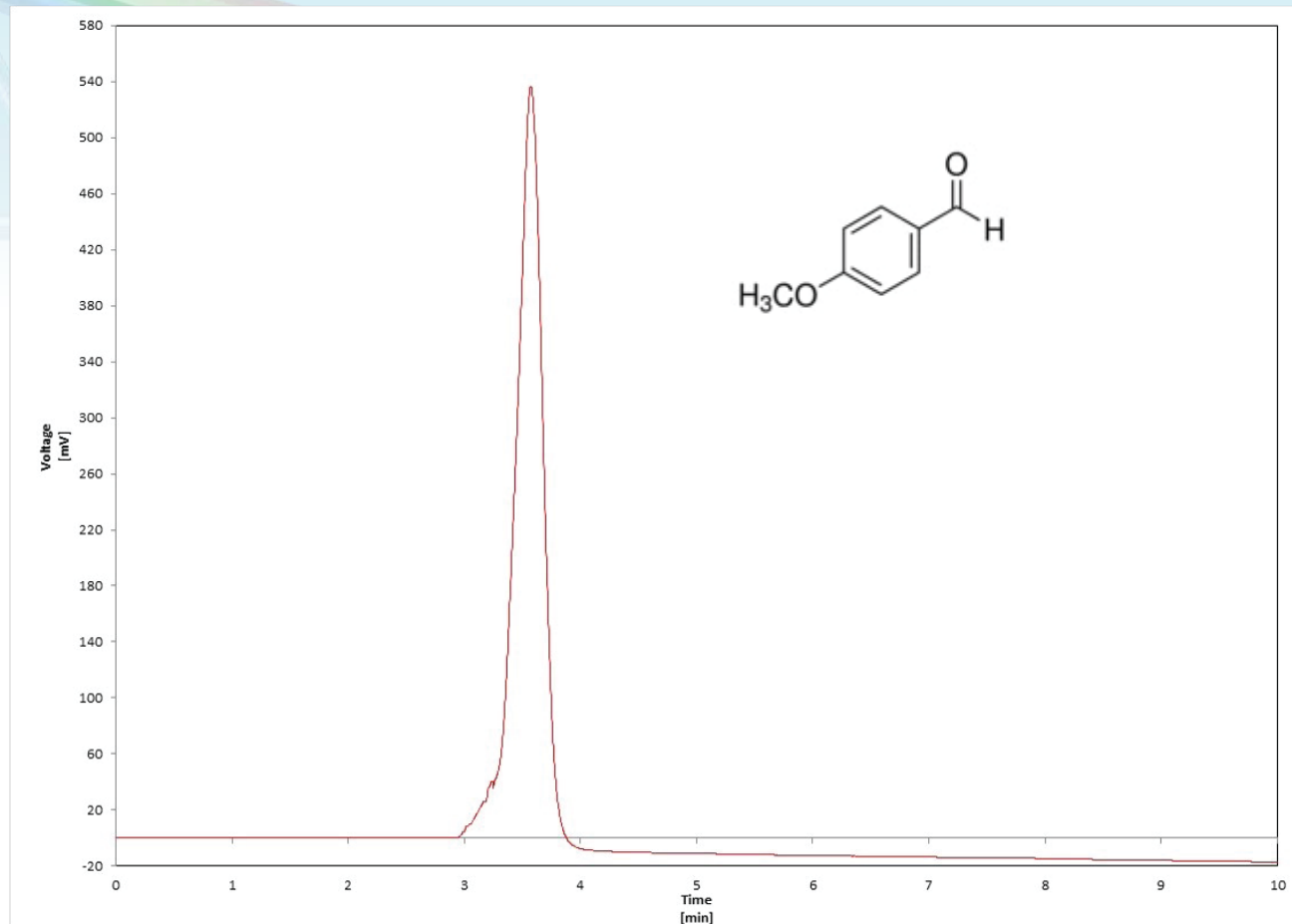
GreenFlash Chromatography (GFC) – The Technology

Gas Liquid Separator to efficiently collect the separated effluent



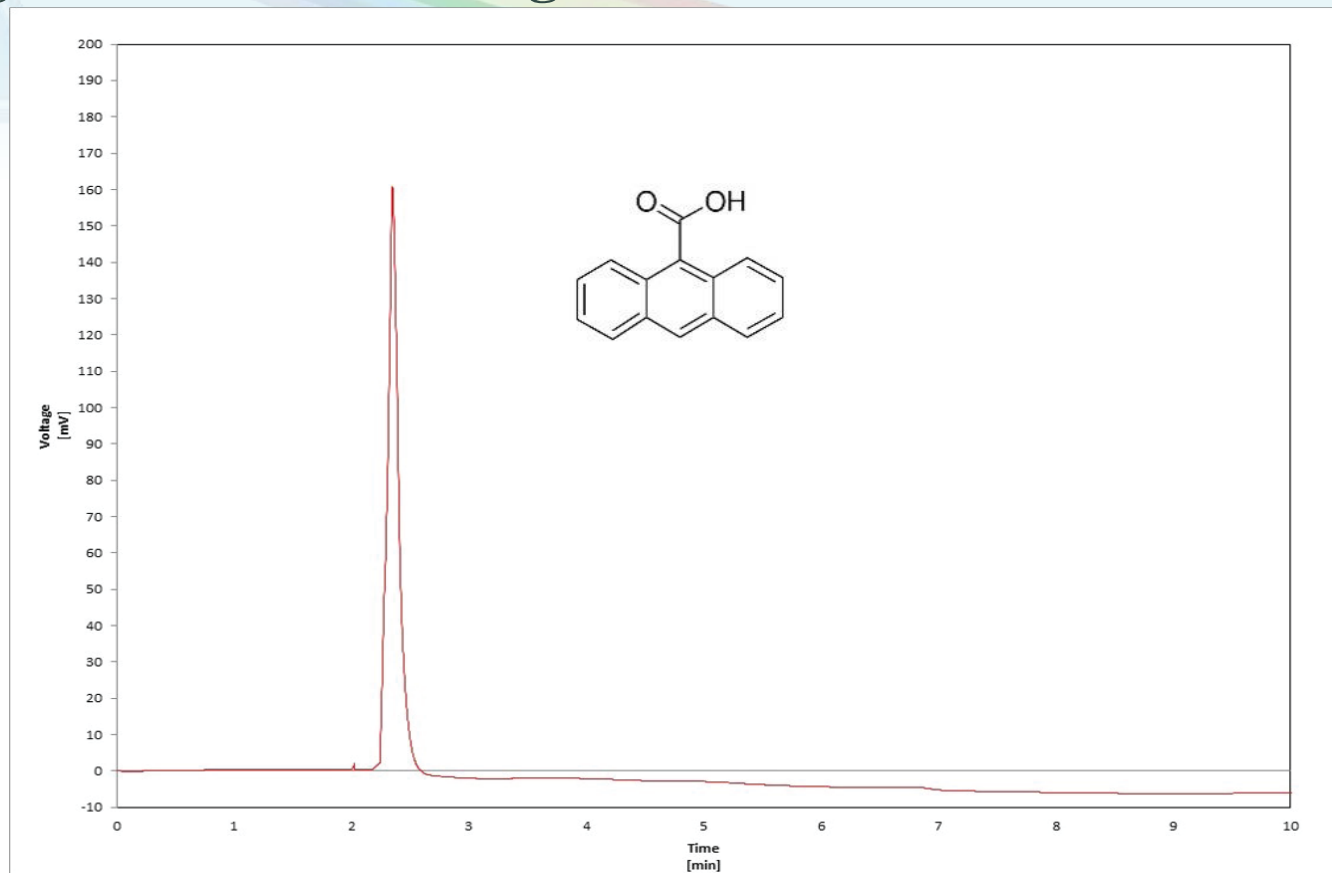
GreenFlash Chromatography (GFC) – Chromatography

- **p-Anisaldehyde: sc-CO₂/Ethyl Acetate – 254nm 5-20% Ethyl Acetate Gradient, 12g/15micron Cartridge**



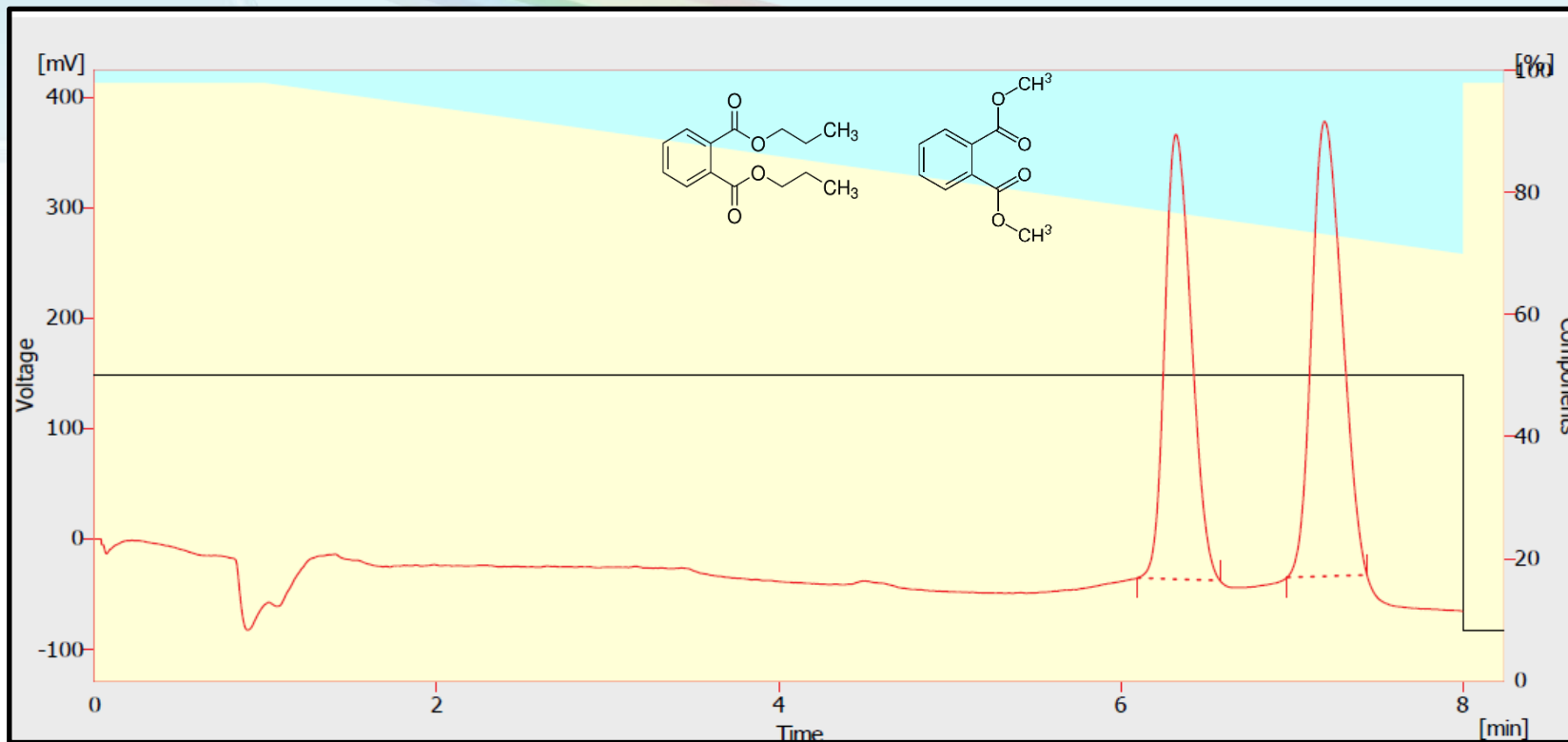
GreenFlash Chromatography (GFC) – Chromatography

9-Anthracene: sc-CO₂/Ethyl Acetate – 254nm, 5-20% Ethyl Acetate Gradient, 12g/15 micron Cartridge



GreenFlash Chromatography (GFC) – Chromatography

Separation of Alkyl Phthalates, 280nm, 5-15% Methanol Gradient, 25mls/min, 12g, 25-micron Cartridge



Cost Analysis - GFC vs. Traditional Flash Chromatography

Single Separation Comparison *

	GFC	Traditional Flash
Non-Polar Solvent	\$ 0.43	\$ 48.73
Polar Solvent	\$ 4.38	\$ 4.38
Nitrogen	\$ 0.61	
Solvent Disposal	\$ 4.38	\$ 53.11
Total	\$ 9.80	\$ 106.22

- Based on data we found that a traditional Flash unit is used 5-10 times per day.
- Being conservative, 5 times/day x 5 days/week x 50 weeks per year = 1250 runs/year.

GFC: \$12,250.

Traditional Flash: \$132,775.

Cost savings ~11 to 1

* Solvent Usage Only, Does not include the workflow advantage.

Assumed: Electrical consumption and cartridge cost equivalent.

Assumed: Solvent disposal cost the same as acquisition cost.

Comments from Key Researchers at Major Pharmaceutical Companies who have seen the GFC Pre-Commercial Unit

- This greatly reduced solvent consumptions and that's a big cost savings.
- GreenFlash will make our chemists more productive (workflow!)
- We could replace 90% of our traditional Flash instruments with GFC.
- I wish we had this during the Acetonitrile shortage.
- This is not another version of an SFC instrument, it is the next generation of Flash Chromatography.
- Traditional Flash cannot separate Biomolecules. The potential for performing some of these separations with GFC is of great interest to us.

We Believe GreenFlash Chromatography is the future!





Thank You !

Questions Are Always Welcome

We thank you for your time, interest, and enthusiasm