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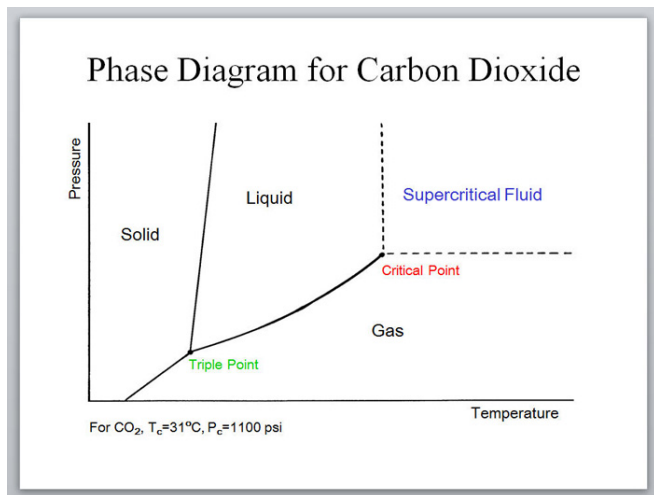
# GreenSep™ SFC Columns

The right choice for achiral  
purification

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# Supercritical Fluid Chromatography (SFC)

The Background ...



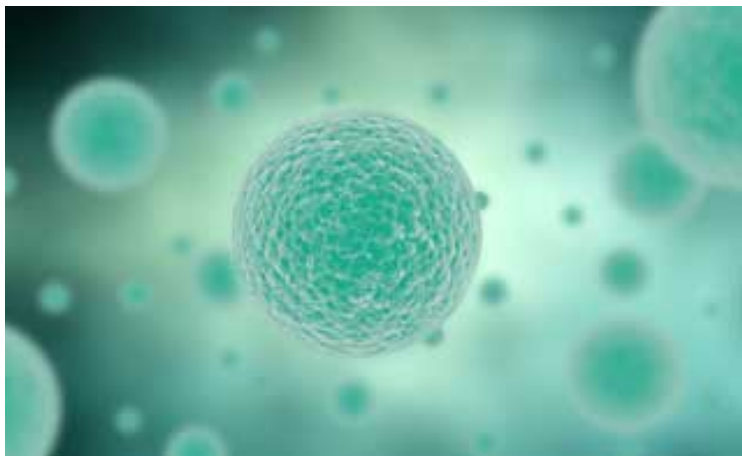
SFC is a “green” chromatographic technique.

The main component of the mobile phase is CO<sub>2</sub> which permits the use of high performance preparative columns (10 – 50 mm internal diameter) with a variety of particle sizes from 3 – 20 μm resulting in the rapid separation and recovery of purified components.

Many historical SFC separations have utilized “older normal phase HPLC types” of stationary phases such as unmodified silica, amino and cyano. These phases are poorly adapted to SFC and present a number of limitations for SFC separations including low capacity, poor selectivity and poor peak shape.

# Welcome to GreenSep

The Logic and History ...



The GreenSep™ family of stationary phases have been specifically engineered for SFC separations paying close attention to bonding coverage, density and all factors leading to high capacity phases which exhibit excellent selectivity and peak shape. The GreenSep range offers a variety of selectivities offering orthogonality.

Many of the GreenSep phases designed for basic and acidic compounds do NOT require mobile phase additives that are commonly required with other brands of phases. Columns are available available in 10 to 50 mm internal diameters and particle size from 3 – 20  $\mu\text{m}$

# GreenSep Columns

With unique selectivities

## GreenSep Naphthyl

Is naphthalene based with intrinsic base deactivation and exhibits strong  $\pi$ - $\pi$  interaction and charge transfer interactions which performs well for diastereomer separations and non-polar compounds. The unique properties of GreenSep Naphthyl place its selectivity between graphitized carbon and alkyl type phases.



## GreenSep PFP

GreenSep PFP is a pentafluoro phenyl based stationary phase specifically designed for the separation of geometrical isomers and diastereomers. GreenSep PFP is the column of choice in separating compounds that contain aromatic groups, polarizable electrons and conjugate systems.

## GreenSep HILIC

Is composed of a polyhydroxylated polymer that is coated and bound to silica providing hydroxyl levels, that are well above conventional silica and diol type stationary phases permitting higher loading.



## GreenSep Nitro

GreenSep Nitro is a nitro aromatic based stationary phase designed for the separation of geometrical isomers and diastereomers. It is the column of choice in separating compounds that contain double bonds, aromatic groups, polarizable electrons and conjugated systems and exhibits a strong charge transfer system

## GreenSep Diol

is a specialty phase designed for SFC with a high density Diol surface coverage which ensures separations that are improved and more reproducible than conventional unbonded silica.



## GreenSep Standard Phases

Silica, Amine and Cyano are also available

# GreenSep Columns

for use without additives

04

## GreenSep Basic

GreenSep Basic, an imidazole based stationary phase that exhibits a highly basic character. It is ideally suited to high performance/high speed SFC applications of chemicals containing amine groups without the use of mobile phase additives



## GreenSep Ethyl Pyridine

GreenSep Ethyl Pyridine is bonded phase of 2-Ethyl pyridine and is ideal for separating chemicals that are functionalized with acids and amine groups

## GreenSep DEAP

GreenSep DEAP is the SFC column of choice for the retention and rapid separation of chemical compounds containing alcohol groups.



## GreenSep 4-Ethyl Pyridine

GreenSep 4-Ethyl Pyridine is an alternative to and provides different selectivity to GreenSep Ethyl Pyridine (2-ethyl pyridine)

## GreenSep Pyridyl Amide

Ideal for separating chemicals that contain both basic amine and acidic groups

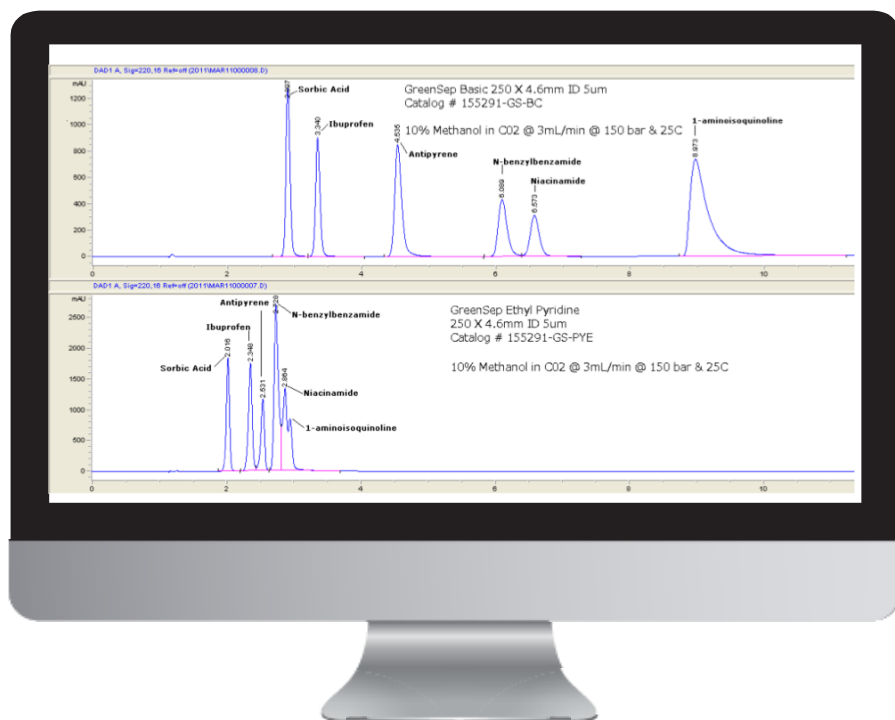


## GreenSep Ethyl Pyridine II

The column ideally suited for the retention and rapid separation of chemicals containing acidic groups. It is a version of bonded 2-Ethyl pyridine

# GreenSep Basic Example

This is an example of GreenSep Basic vs Ethyl Pyridine



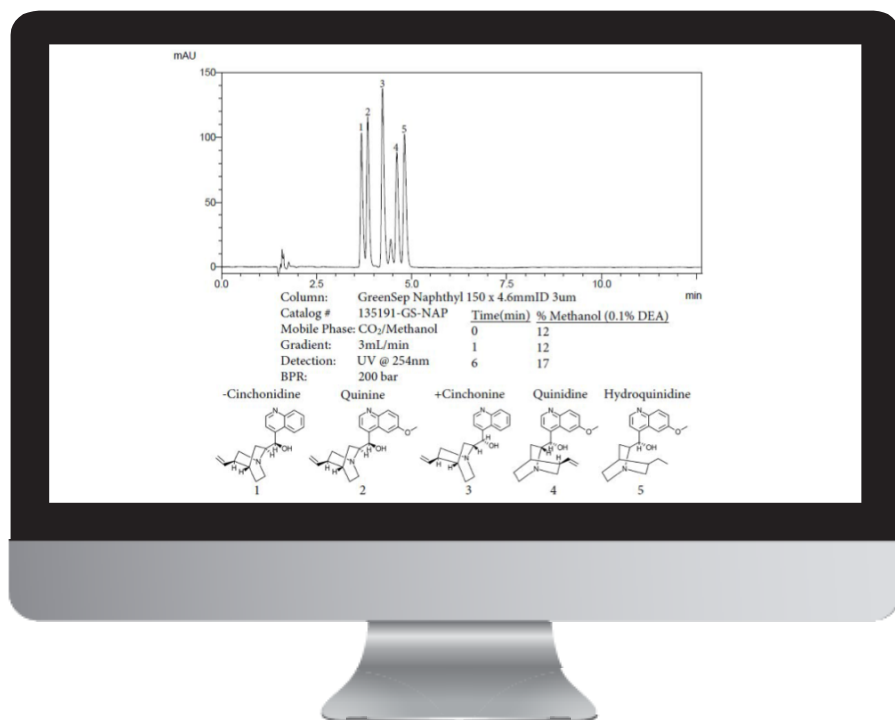
## The ultimate aim is purification!

The chromatogram shown contains chemicals that are functionalized with amine and acidic groups and is a prime example of the superior peak shape performance and separation capacity obtainable with the GreenSep Basic column when compared to a 2-Ethyl Pyridine column.

- Same Conditions
- Shows different and improved resolution of Basic over Ethyl Pyridine

# GreenSep Naphthyl Example

This is an example of GreenSep Naphthyl being used for Diastereomers



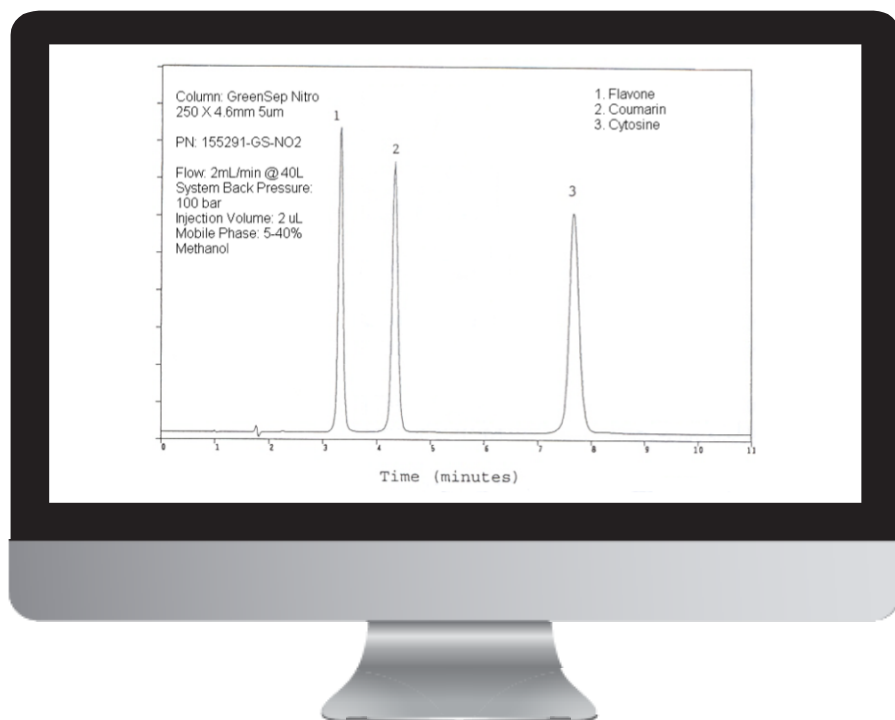
## Shorter Analysis Time!

A naphthalene based SFC material, with high bonding density and intrinsic base deactivation due to a rigid structure. The inherent shape selectivity, strong  $\pi$ - $\pi$  interactions and charge transfer interactions enable GreenSep Naphthyl to perform well for diastereomers separations and non-polar compound separations.

- The unique properties of GreenSep Naphthyl place its selectivity between graphitized carbon and alkyl type stationary phases
- Rapid analysis and great resolution between compounds

# GreenSep Nitro Example

This is an example of GreenSep Nitro



## Fast Column Equilibration!

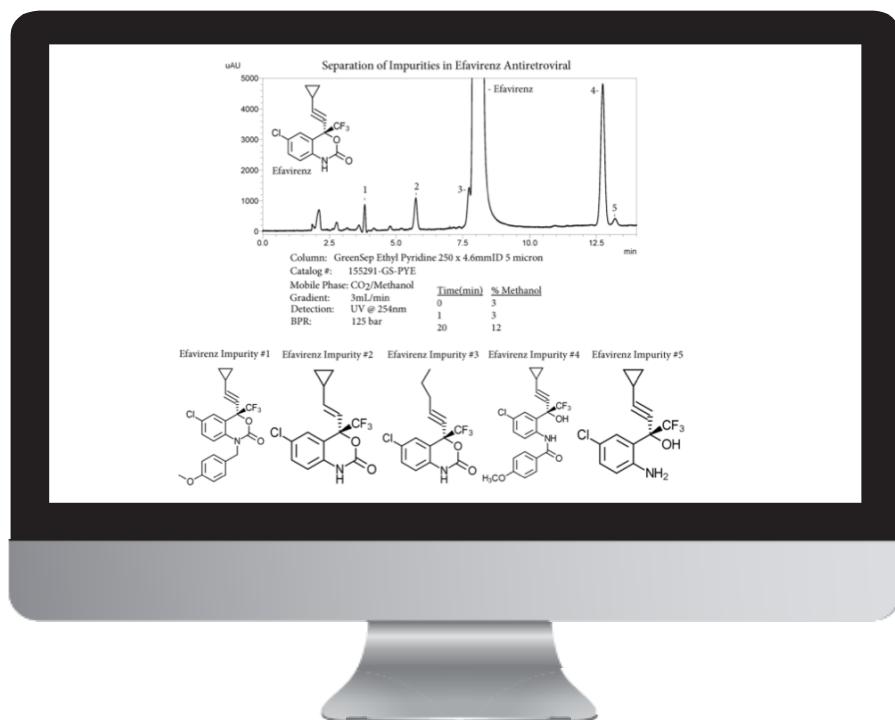
GreenSep Nitro is the column of choice in separating compounds that contain double bonds, aromatic groups, polarizable electrons or conjugated systems and exhibits a strong charge transfer system.

- Separation of Flavone, Coumarin and Cytosine
- Great resolution between compounds



# GreenSep Ethyl Pyridine Example

This is an example of GreenSep Ethyl Pyridine in the determination of pharma degradation products



## Environmentally Conscious Technology!

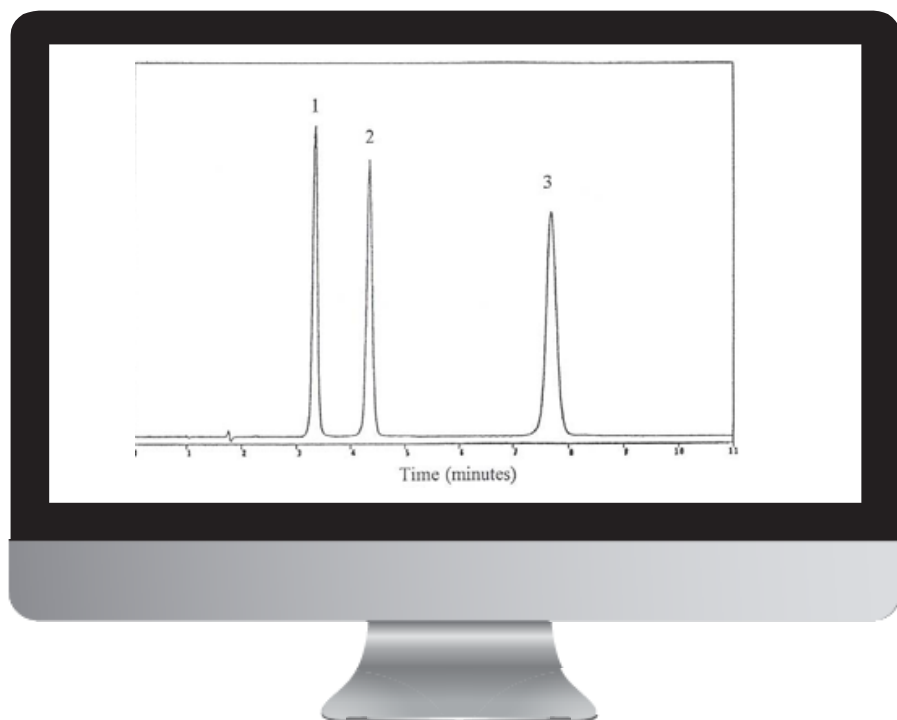
The determination of degradation products and process impurities in pharmaceutical active ingredients has always posed a challenge for the analysis of pharmaceutical compounds.

The SFC separation of Efavirenz, an antiretroviral pharmaceutical active ingredient is shown.

- High resolution between closely related compounds

# GreenSep PFP Example

This is an example of GreenSep PFP ideal for diastereomers



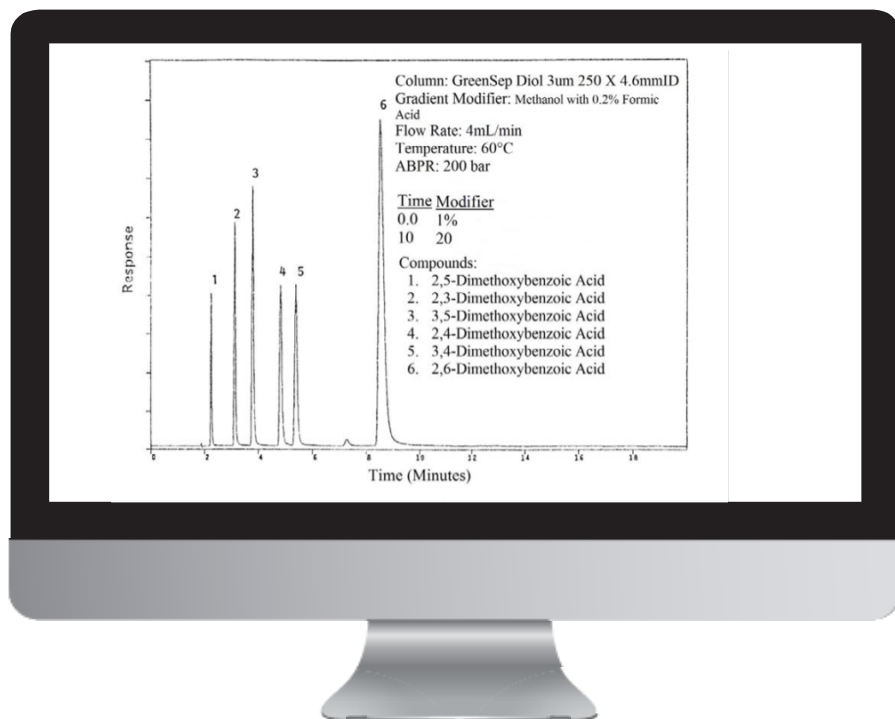
## Easy to scale-up!

Specifically designed for the separation of geometrical isomers and diastereomers. GreenSep PFP is the column of choice in separating compounds that contain aromatic groups, polarizable electrons and conjugate systems. In many cases GreenSep PFP provides orthogonal separations when compared to GreenSep Nitro.

- Separation of Naphthalene, Phenanthrene and Pyrene
- Great resolution between compounds

# GreenSep Diol Example

This is an example of GreenSep Diol for Acidic analytes



## Higher Efficiency!

GreenSep Diol is a specialty phase designed for SFC with a high density Diol surface coverage which ensures separations which are improved and more reproducible than conventional unbonded silica. GreenSep Diol is particularly suitable for acidic and basic analytes.

- ❑ Fast Separation
- ❑ Great resolution between compounds

# Achiral SFC Flow Chart

This is an example of the selection process

