SANTAI®
TECHNOLOGIES

SepaBean® machine

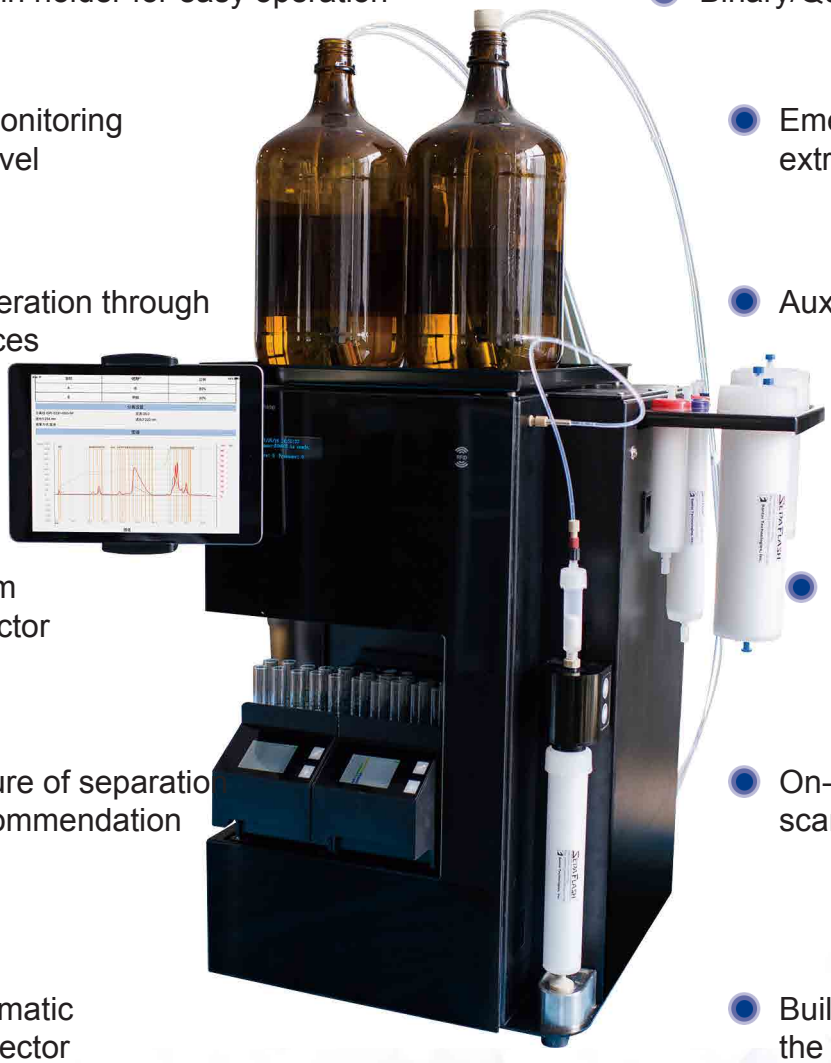
Flash Chromatography System

About Us

Santai Technologies is a technology company founded in 2004 and focused on developing separation and purification tools and services for professionals and scientists in pharmaceutical, biotechnology, fine chemicals, natural products and petrochemical industries. The products of Santai Technologies include the flash chromatography system SepaBean® machine, SepaFlash® series flash columns, the platform for chemical knowledge sharing as well as chemicals search and trading ChemBeanGo®, and smart hardware and software tools such as ChemBeanGo App.

SepaBean® machine Flash Chromatography System

- Smart column holder for easy operation
- Binary/Quaternary solvent elution
- Real-time monitoring of solvent level
- Emergency stop button for extra safety and protection
- Wireless operation through mobile devices
- Auxiliary column holder



- 200 - 800 nm UV/Vis detector
- Maximum pressure up to 200 Psi with built-in pressure alert module
- Built-in feature of separation method recommendation
- On-line full wavelength scanning
- Built-in automatic fraction collector
- Built-in air pump to purge the residual solvents

Chinese patents granted: ZL 2012 1 0320096.0 ZL 2015 1 0012855.0 ZL 2015 1 0312780.8 ZL 2015 1 0335132.4 ZL 2015 1 0341030.3

Features of SepaBean® machine

- **Wireless Operation Through Mobile Devices**
  The flexible wireless control method is especially suitable for scenes that need to be protected from light or placed in an isolator to run separation experiments.

- **Power Failure Recovery**
  The built-in power-off recovery function in the software minimizes the loss caused by accidental power failure.

- **Smart Column Holder**
  Column holder with touchpad could achieve automatic fixing of the flash column.*

- **Separation Method Recommendation**
  The software has a built-in separation method database that automatically recommends the most appropriate separation method based on the key information entered by the user, thereby improving work efficiency.

- **Fraction Collector**
  Tube racks with LCD display enable users to easily track the tubes containing collected fractions.

- **Local Network Data Sharing**
  Multiple instruments could form a local area network to facilitate internal data sharing and resource optimization in the laboratory.

- **RFID Technology**
  Automatic identification of current flash column information based on RFID technology, facilitating the use and maintenance of the columns.**

- **21-CFR Part 11 Compliance**
  The control software complies with FDA requirements for system safety (21-CFR Part 11), making the instrument more suitable for pharmaceutical R&D companies and laboratories.

Notes:

*Smart column holder is not applicable for SepaBean machine U.

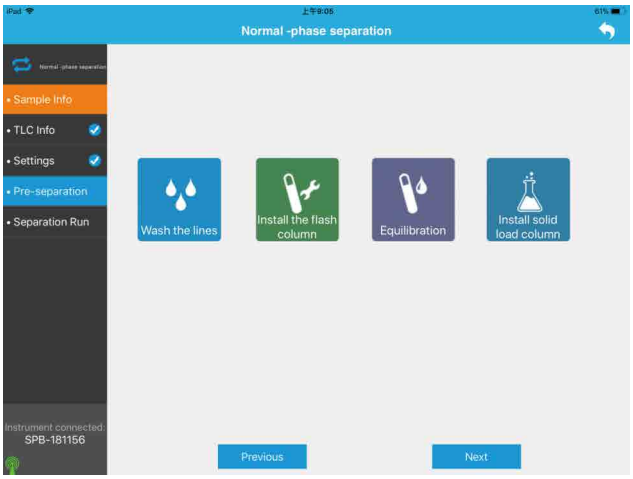
**RFID module is not applicable for SepaBean machine U or T.

Smart purification system makes the purification easier

The smart flash chromatography system SepaBean® machine launched by Santai Technologies has the built-in feature of separation method recommendation. Even the beginners or non-professional chromatography operators could easily complete the purification task.

Smart purification with "Touch & GO" simplicity

SepaBean® machine is operated through mobile device, with iconized UI, it is simple enough for the beginner and non-professional to complete routine separation, but also sophisticated enough for the professional or guru to complete or optimized a complex separation.



Built-In Method Database — Knowledge Retained

Researchers around the world spent numerous resources to develop methods to separate and purify compound mixtures, whether it's synthesized mixtures, or extracts from natural products, these valuable methods are usually stored in single location, isolated, disconnected, and become "information island" over the time. Unlike traditional flash instrument, SepaBean® machine employs database and distributed computing technology to retain and share these methods across secured organizational network:

•Patented SepaBean® machine has built-in relational database to store separation methods, researchers can query existing or update new separation method simply using compound name, structure or project code.

•SepaBean® machine is network ready, multiple instruments within an organization can form a private channel, enabling separation methods to be shared across the entire organization, authorized researchers with permission can access and run these methods directly without having to re-develop the methods.

•SepaBean® machine can auto discover and connect to peer instrument, once multiple instruments are connected, data is automatically synced, researchers can access their methods in any connected instrument from any location.

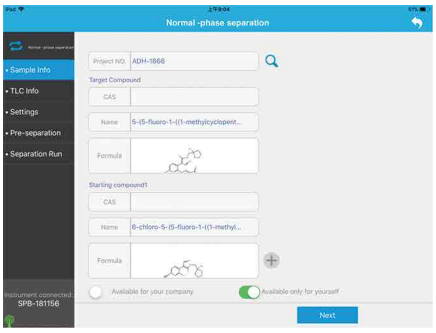
Unique “SepaBean® Approach” results unique “SepaBean® Advantage”

The “SepaBean® Approach”, the THRee STeP procedure:

•Step 1: Join SepaBean® machine to local area network (LAN) with or without internet access, multiple SepaBean® instruments will auto-connect and auto-sync data;

•Step 2: Create user account for researchers before operating the machine for the first time;

•Step 3: Fill in compound information before separation, including key starting materials if the compound is synthesized.



“SepaBean® Advantage”:

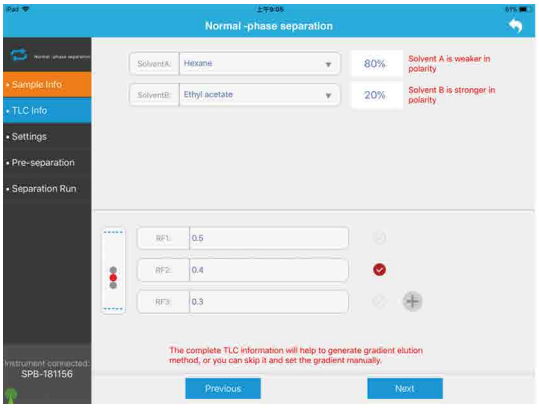
•Every single method and related data which researchers spent resources to develop is retained in the database and searchable across the entire authorized network, these methods and related data become valuable assets of the organization, including information of all the compounds synthesized and purified over the years.

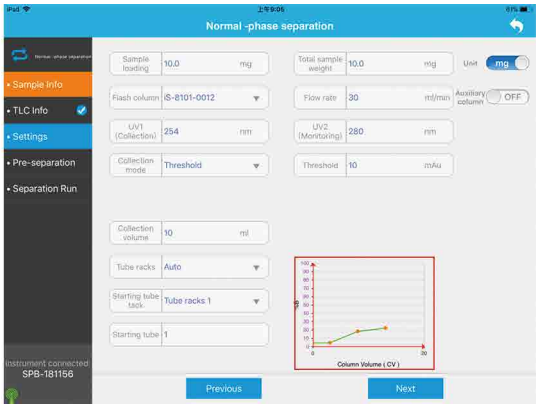
•Simply input compound information, such as name, CAS # or structure, previous matched or similar methods will pop up and you can follow the method to finish a separation, or start a new one so that other researchers can benefit from it.

•Non-interrupted separation. If the SepaBean® machine was interrupted or replaced, you could continue the run in another SepaBean® machine, just install the interrupted flash column and test-tube rack in any connected SepaBean® machine nearby, log in and continue where you left-off.

TLC-to-Gradient

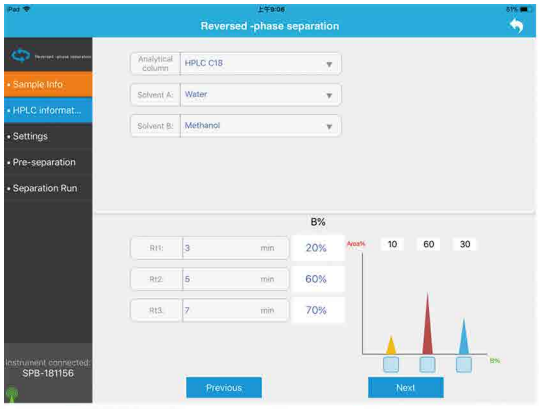
Now, with the new feature of TLC-to-Gradient built in the control software of SepaBean® machine, the whole sample preparation procedure is greatly accelerated. The user only needs to input the TLC information and the loaded amount of the sample, the software will automatically recommend the proper flash column for the separation. Also the optimized elution gradient will be generated. As a result, the work efficiency can be significantly improved.

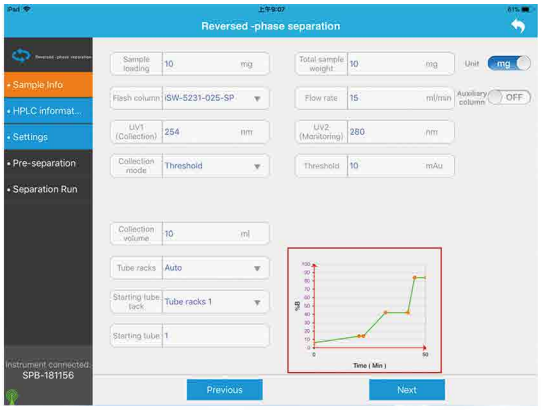




HPLC-to-Gradient

For reversed-phase separation, the control software of SepaBean® machine can also help the user with smart recommendations. Input the analytical HPLC information, including the retention time of the sample, the percentage of Solvent B when specific component is eluted out, the peak area of the target product and the primary impurities, the elution gradient will be automatically generated.

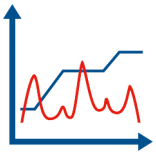




User Interface

- **Streamlined operation**
  The simple parameter setting as well as the clear interface enables the user to easily understand and operate.

- **Collection methods**
  These collection methods are supported: all, threshold, slope, time, waste.



- **Real-time parameters modification during running**
  During separation running, the separation parameters could be modified at any time, including flow rate, gradient, collection volume, threshold value for collection, etc.

- **Gradient hold**
  The elution gradient could be hold during the separation procedure to improve the resolution of the components.

- **Flash column recommendation**
  The most proper flash column could be recommended according to the key sample information.

- **History records**
  The history records of the current user's experiments could be reviewed at any time.

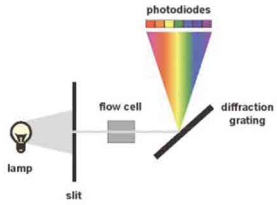
Detectors

- **Variable Dual Wavelength Diode Array Detector (DAD)**

  •Suitable for detecting the compounds with UV or visible light absorption

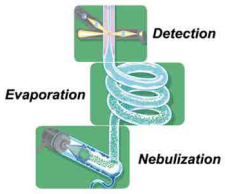
  •Built-in feature of full wavelength scanning for the easy determination of the maximum absorption wavelength of the sample, contributing to higher detection sensitivity as well as lower sample loss

  •Review of full wavelength scanning data in the history records could help the user evaluate the purity of the product, making the separation results more reliable



- **Evaporative Light Scattering Detector (ELSD)**

  Universal detector with high sensitivity, commonly used for analysis of compounds where UV detection might be a restriction and therefore compounds do not efficiently absorb UV radiation, such as sugars, lipids, polymers, fatty acids, amino acids, etc.



Choose the SepaBean® machine that's right for you

Model	SepaBean® machine U	SepaBean® machine T	SepaBean® machine	SepaBean® machine 2
				
Description	Entry level model with all the features of SepaBean control software. Meet the demands of daily separation and purification, including normal phase and reversed phase separation.	Cost effective model with all features of SepaBean control software. Binary gradient with any combinations of two solvents. Optional ELSD to cover more types of samples.	Standard version. Binary gradient with four solvent lines, high pressure mixing. Optional ELSD to cover more types of samples.	Medium pressure model which could perfectly match with SepaFlash spin-welded columns for higher separation efficiency. Binary gradient with any combinations of two solvents, 3rd solvent as modifier, able to run complex separation conditions. Optional ELSD to cover more types of samples.
Flow Range	1 - 100 mL/min (U100) 1 - 200 mL/min (U200)	1 - 200 mL/min	1 - 200 mL/min	1 - 200 mL/min
Maximum Pressure	100 psi (6.9 bar, U100) 200 psi (13.8 bar, U200)	200 psi (13.8 bar)	200 psi (13.8 bar)	500 psi (33.5 bar)
Pumping System	Highly accurate, maintenance free ceramic pump	Highly accurate, maintenance free ceramic pump	Highly accurate, maintenance free ceramic pumps	Highly accurate dual piston pumps
Gradients	Two solvents, binary	Four solvents binary with any combinations of two solvents	Four solvents binary, high pressure mixing	Four solvents binary with 3rd solvent as modifier
Detector	Fixed wavelength (254 nm, optional other wavelength) or DAD variable UV (200 - 400 nm) or DAD vairable UV (200 - 400 nm) + Vis (400 - 800 nm)	DAD variable UV (200 - 400 nm) or DAD vairable UV (200 - 400 nm) + Vis (400 - 800 nm) or ELSD	DAD variable UV (200 - 400 nm) or DAD vairable UV (200 - 400 nm) + Vis (400 - 800 nm) or ELSD	DAD variable UV (200 - 400 nm) or DAD vairable UV (200 - 400 nm) + Vis (400 - 800 nm) or ELSD
Sample Loading Capacity	10 mg - 33 g	10 mg - 33 g	10 mg - 33 g	10 mg - 33 g
Column Sizes	4 g - 330 g, up to 3 kg with adapters	4 g - 330 g, up to 3 kg with adapters	4 g - 330 g, up to 3 kg with adapters	4 g - 330 g, up to 3 kg with adapters
Other Specifications	• Gradient types: isocratic, linear, step • Flowcell optical path length: 0.3 mm (default); 2.4 mm (optional) • Spectral display: single/dual/all-wavelengths* • Sample loading method: manual load • Fraction collection method: all, waste, threshold, slope, time • Fraction collector: Standard: tubes (13 mm, 15 mm, 18 mm, 25 mm); Optional: Frencth square bottle (250 mL, 500 mL) or large collection bottle; Customizable collection container • Control device: wireless operation through mobile devices** • Certificate: CE, cTUVus (in process)			

Notes:

*All-wavelength scanning function is not applicable for SepaBean® machine U with fixed wavelength UV detector.

**The instrument is controlled via App on mobile device by default for SepaBean® machine U. iPad and related supporting stand are optional.

Applications

The Purification of Porphyrins

Since porphyrins can easily form 1:1 coordination compounds with metal ions, therefore porphyrins are widely used in the biophotosynthesis simulation, solar cells, organic electroluminescence, photoconductive materials as well as research and development for anti-tumor drugs.

Instrument	SepaBean® Machine	
Cartridges	40g SepaFlash® HP Series silica (25 - 40 μm, 60 Å, Order number: SW-5102-040)	
Wavelength	254 nm (detection), 365 nm (monitoring)	
Mobile phase	Solvent A: N-hexane Solvent B: Dichloromethane	
Flow rate	25 ml/min	
Sample load	200 mg	
Gradient	Column volume (CV)	% Solvent B
	0	12
	3	12
	6.3	37
	12	40
	22	95

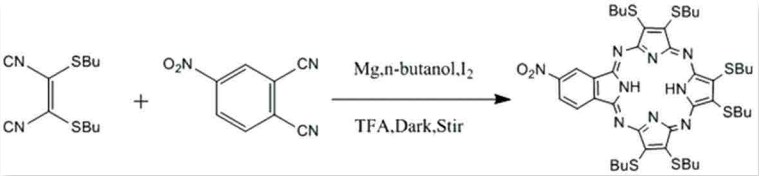


Figure 1. The reaction formula of the porphyrin sample.

Figure 2. The flash chromatogram of the porphyrin sample.

The Purification of Small Molecule Peptide

With the development of biotechnology as well as peptide synthesis technology, more and more peptide drugs have been developed and applied clinically. In this application note, thymopentin (hereinafter referred to as TP-5) was chosen as the sample. Peptide products of high purity (>94%) was successfully obtained by a single sample injection on a SepaFlash HP Bio series flash cartridge combined with SepaBeanTM machine, suggesting a fast, highly efficient and low cost solution for the purification of such small molecule peptide samples.

Instrument	SepaBean® Machine	
Flash cartridge	12g SepaFlash HP Bio C18 reversed-phase cartridge(15 μm, 100 Å, Order number: Bio-SW-5223-012-SP)	
Sample loading	45 mg raw material, dissolved and loaded by a sample injector	
Wavelength	220 nm, 254 nm	
Mobile phase	Solvent A: Water Solvent B: Methanol	
Flow rate	200 mg	
Gradient	Time / min	% Solvent B
	0	12
	10.0	90
	12.0	90

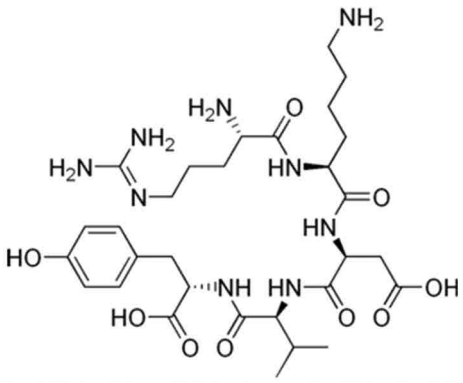


Figure 3. The chemical structure of TP-5.

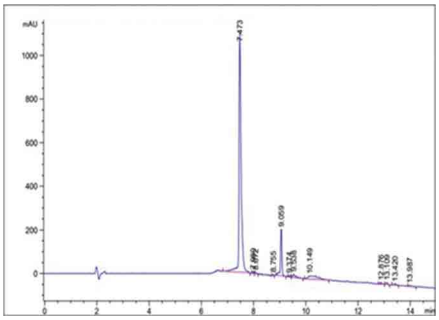


Figure 4. The chromatogram of TP-5 raw material by HPLC analysis.

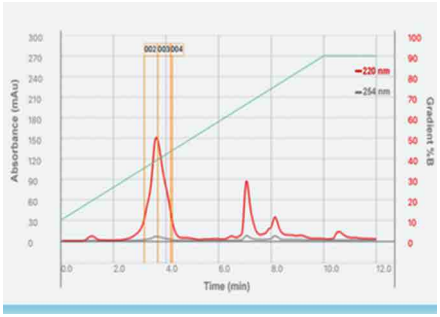


Figure 5. The chromatogram of TP-5 raw material by flash purification.

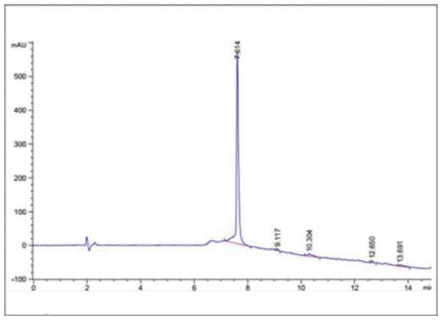


Figure 6. The chromatogram of purified TP-5 by HPLC analysis.

The Purification of the Synthetic Intermediates of Drugs

The reversed-phase (RP) separation mode is widely used in the separation and purification of weak polar or non-polar compounds. In this application note, a 330 g sized SepaFlash® Bonded Series C18 cartridge was used for the synthetic intermediates of a specific drug.

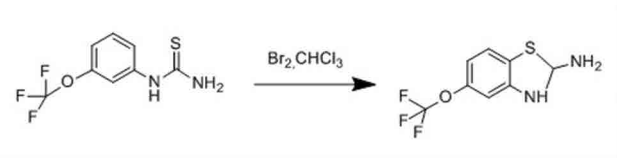


Figure 7. The chemical structure of the target product.

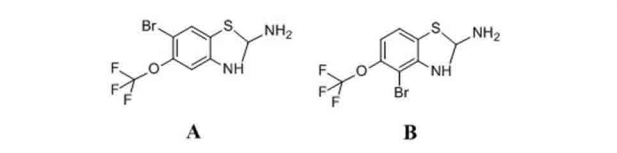


Figure 8. The chemical structure of the impurities in the sample.

Experimental setup:

Instrument	SepaBean® Machine T	
Flash Cartridge	330g SepaFlash® Bonded Series C18 cartridge (spherical silica, 20 – 45 μm, 100 Å, Order number: SW-5222-330-SP)	
Wavelength	220 nm;254 nm	
Mobile phase	Solvent A: Water Solvent B: Methanol	
Flow rate	50 ml/min	
Sample loading	5 ml (1.6 g)	
	Time / min	% Solvent B
	0	30
Gradient	53	75
	63	75
	73	90

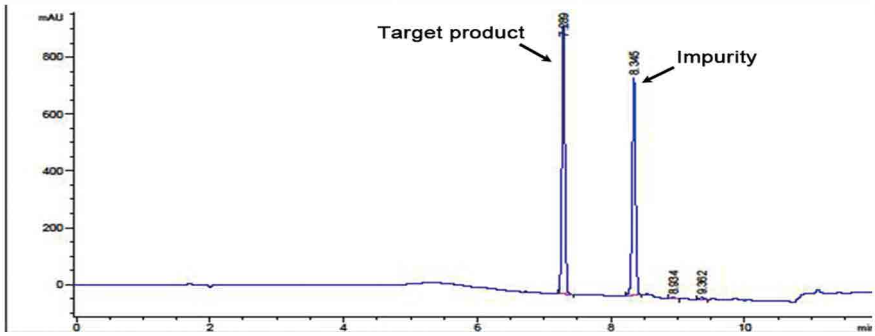


Figure 9. The chromatogram of the sample by HPLC analysis.

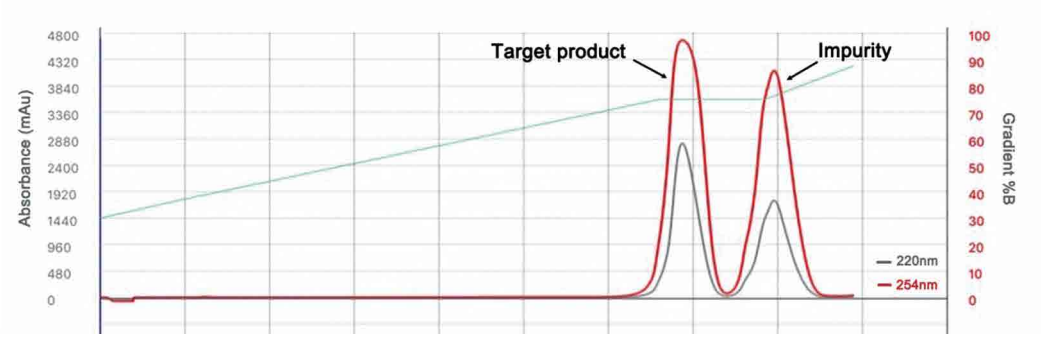


Figure 10. The chromatogram of the sample by flash purification.

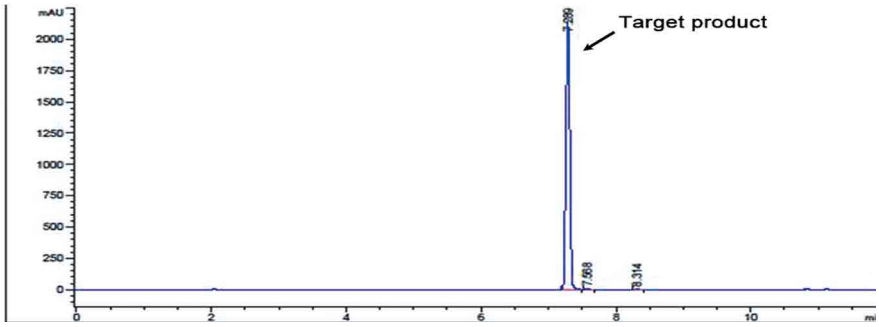


Figure 11. The chromatogram of the purified sample by HPLC analysis.

The Application in the Field of Organic Optoelectronic Material

Organic optoelectronic materials are a kind of organic materials having photoelectric activities, which are widely used in various fields such as light-emitting diodes (LEDs), organic transistors, organic solar cells, organic memory, etc. Organic optoelectronic materials are receiving more and more attention from researchers because of its inherent advantages. To ensure better performance in the later stage, it is necessary to improve the purity of the target compound as much as possible in the early stage of synthesizing organic optoelectronic materials. In this application note, the SepaBean® machine combined with the SepaFlash® purification cartridges were applied to the organic optoelectronic material sample for the fast preparation of the target product.

Experimental setup:

Instrument	SepaBean® Machine	
Cartridges	40g SepaFlash® Standard Series cartridge (40 – 63 μm, 60 Å, Order number: S-5101-0040)	
Wavelength	254 nm (detection), 365 nm (monitoring)	
Mobile phase	Solvent A: N-hexane Solvent B: Ethyl acetate	
Flow rate	15 ml/min	
Sample load	1.0 g	
Gradient	Column volume (CV)	% Solvent B
	0.0	0
	15.0	15
	16.5	80
	18.0	80

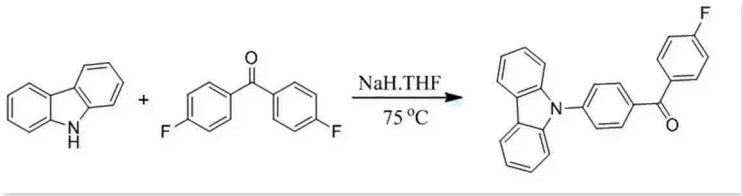


Figure 12. The reaction formula of a type of organic optoelectronic material.

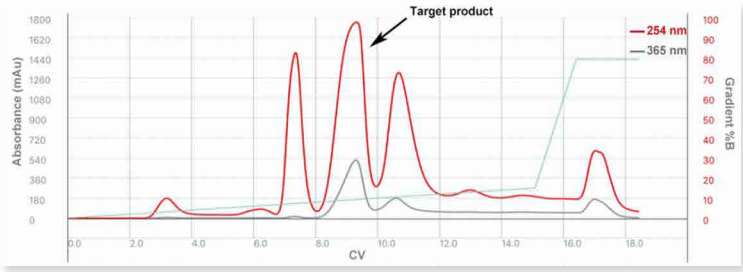


Figure 13. The flash chromatogram of the sample.

The Application in the Field of Small Molecule Synthesis

In this application note, the sample came from the last step of a specific synthetic reaction. As a start, a 25 g SepaFlash® Bonded Series C18 cartridge was used for small amount of sample loading. Based on the separation result, a 120 g SepaFlash® Bonded Series C18 cartridge was used for scale-up sample purification. The results showed good separation efficiency as well as great reproducibility for SepaFlash® cartridges.

Experimental setup:

Instrument	SepaBean® Machine	
Cartridges	25 g SepaFlash® Bonded Series C18 cartridge(20 – 45 μm, 100 Å, Order number: SW-5222-025-SP)	120 g SepaFlash® Bonded Series C18 cartridge(20 – 45 μm, 100 Å, Order number: SW-5222-120-SP)
Flow rate	25 ml/min	40 ml/min
Sample load	1.3 ml (162 mg)	8.0 ml (1.0g)
Wavelength	220 nm, 254 nm	
Mobile phase	Solvent A: Water Solvent B: Methanol (0.1% ammonia water)	
Gradient	Time / min	% Solvent B
	0	10
	20	40
	33	40
	35	46
	50	46
	70	60
	72	90
	85	90

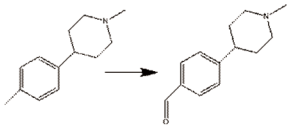


Figure 14. The last step of a specific synthetic reaction. The chemical on the right side is the target product.

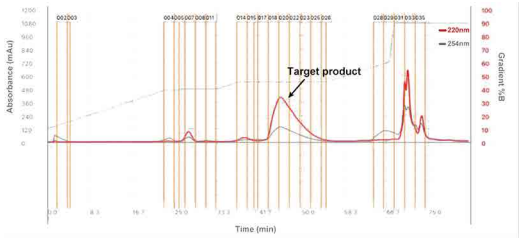


Figure 15. The flash chromatogram of the sample at small loading amount by a 25 g flash cartridge.

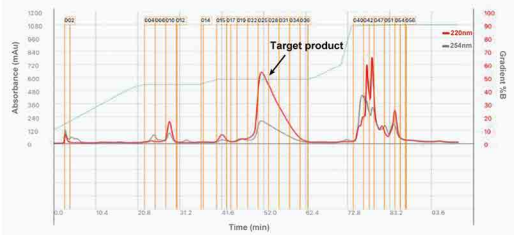


Figure 16. The flash chromatogram of the sample at scale-up loading amount by a 125 g flash cartridge.

The Application of ELSD in the Purification of Non-UV Absorbing Compounds

In chemical synthesis, many compounds are absent with UV absorption structures. For the purification of these compounds, commonly used UV detector cannot meet the requirement of real-time monitoring for the eluting procedure. In this application note, a pharmaceutical intermediate was utilized as the sample to show the application of ELSD in sample purification.

Figure 17. The chemical structure of a pharmaceutical intermediate.

Experimental setup:

Instrument	SepaBean® machine T	
Flash Cartridge	12g SepaFlash® Standard Series flash cartridge (irregular silica, 40-63μm, 60Å, Order number: S-5101-0012)	
Detector	UV:254 nm;280 nm SEPA-FP LT-ELSD	
Mobile Phase	Solvent A: Petroleum Ether Solvent B: Ethyl Acetate.	
Flow Rate	System: 30 mL/min Split flow for ELSD: 0.5 mL/min	
Sample Load	600 mg	
Gradient	Time (CV)	Solvent B (%)
	0	0
	11	18
	15	18
	21	34
	24	34

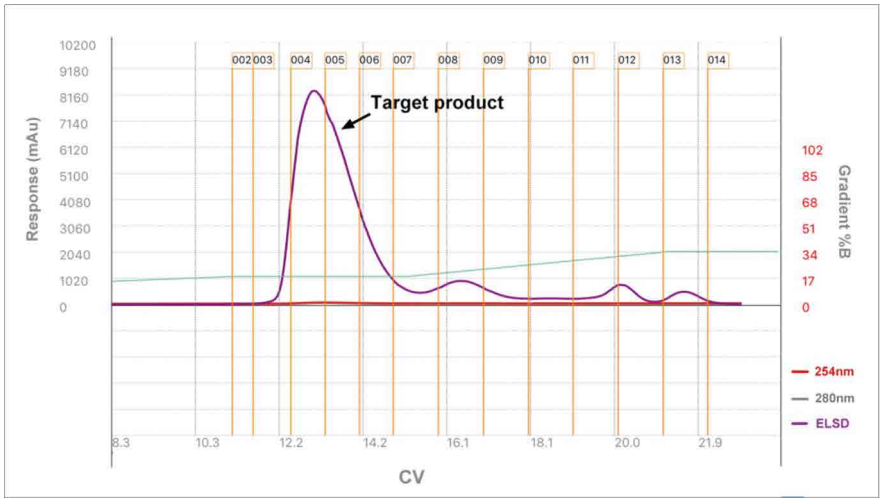
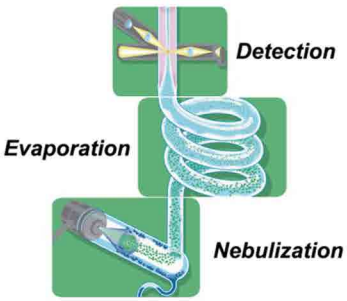


Figure 18. The flash chromatogram of a pharmaceutical intermediate.



CBG App

Santai Technologies Inc.

Address: No. 78 Qingyang Road, Xinbei District, Changzhou, Jiangsu Province, China

Website: www.santaitech.com

CHINA

Main Office: +86 519 8515 0175
Fax: +86 519 8515 3561
Order mail: order@santaitech.com
Support mail: support@santaitech.com

CANADA

Tel: +1 418-580-0437
Order mail: ca_order@santaitech.com
Support mail: ca_support@santaitech.com

INDIA

Tel: +91 937-181-2696
Order mail: in_order@santaitech.com
Support mail: in_support@santaitech.com

SANTAI TECHNOLOGIES®