

ChiralTek UPE Cartridges Product Manual and Application Notes

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ChiralTek Pte Ltd
192 Westwood Crescent
Singapore 648559

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ChiralTek Pte Ltd
192 Westwood Crescent
Singapore 648559

ChiralTek Ultra-high Performance Extraction UPE Cartridges

Product Manual and Application Notes

Introduction

The Ultra-high Performance Extraction (UPE) cartridges are a novel type of solid phase extraction (SPE) cartridges manufactured by ChiralTek. The UPE particles were prepared through a specially-designed procedure by bonding C18 (ODS) and ChiralTek proprietary functional groups onto high-quality porous spherical silica particles. By using a ChiralTek proprietary packing approach, the UPE particles were then packed into kinds of polypropylene tubes with different sizes to manufacture several models of UPE cartridges for ultra-high performance solid phase extractions. The following Figure (A) shows a typical photo of model UPE-20 cartridges.



Figure(A). Typical Photo for UPE-20 cartridges

The UPE-20 model cartridges (specification: 20 mg/3mL, 120Å, 50 PCs/pkg) in Figure (A) are suitable for extraction of small volume samples (0.5 – 200mL). The sample capacity of the UPE-20 cartridges are equivalent to other supplier's 100-200mg/3mL ODS (C18) type of conventional SPE cartridges. Similarly, another model UPE-90 cartridges (specification: 90 mg/6mL, 120Å, 25 PCs/pkg) in Figure (B) are suitable for extraction of large volume samples (500 – 2000mL).



Figure(B). Typical Photo for UPE-90 cartridges

All the UPE cartridges are especially designed to perfectly work with ChiralTek PSPE series of positive-pressure SPE instruments which can easily and completely eliminate cross-over contaminations. The UPE cartridges can also be used to conveniently achieve high efficient sample treatments for different types of complicated samples including types of biological and environmental samples.

Unique Characteristics

Due to the unique co-operative functioning of the bonded C18 (ODS) and ChiralTek proprietary functional groups, the novel UPE cartridges exhibit excellent column efficiency, high reproducibility, high elution efficiency, and very high extraction recovery. The specially-designed synthetic procedure allows the UPE particles to contain ultra-high content of ODS functional group and the ChiralTek proprietary functional group. This directly results in ultra-high sample capacity for the novel UPE cartridges.

Compared to other traditional SPE cartridges, the UPE cartridges contain much thinner column beds and much smaller volume of the packing materials (only 5 to 10% of other traditional SPE cartridges). After loading the sample, extremely small amount of organic solvents (0.2-0.3mL for UPE-20 and UPE-30; 1.2-1.5mL for UPE-60 and UPE90 cartridges) can be used to quickly elute out and simultaneously concentrate the extracts in the UPE cartridges. The elute can be collected in 1.5-mL sample vials for direct injection and final analysis. Both eluting and concentrating operations can be completed in one step without extra evaporating or nitrogen drying procedure when using UPE cartridges. This makes the UPE cartridges are idea choices for trace analysis of complicated samples when working with the PSPE equipments.

Application and Requirements

The final products of the UPE cartridges were packed into light-tight anti-static bags under nitrogen. The originally-sealed UPE cartridges can be stored for a quite long time (several years) at room temperature. The UPE cartridges could be stored for six months in a cool and ventilated dark place after opening the original sealing package.

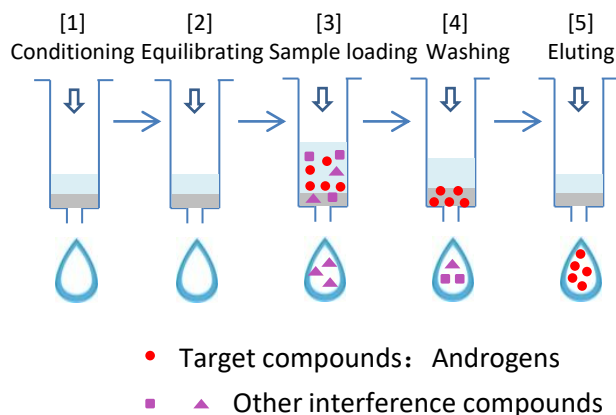
The external packing plastic box for UPE cartridges is strong in compression. The end users are strongly recommended to use the original external packing box from ChiralTek for storing the UPE cartridges and to avoid any external force extrusion.

The UPE column wall is made from polypropylene. The two frits are made from polyethylene. Most of the common solvents and solutions are compatible with the polypropylene and polyethylene materials. If non-standard solvents are needed for conditioning or elution, please contact ChiralTek for technical support.

Since the strong alkalic compounds (e.g., NaOH) can cause damages to the UPE column bed, they cannot be used as elution solution additives or sample solution additives. The UPE cartridges have many different models with different specifications and column capacities. Please choose proper model according to the sample volume and total concentration of all possible compounds in the sample.

Easy Method Development by Using the UPE Cartridges

Since the UPE cartridges have excellent column efficiency, high elution efficiency, and very high extraction recovery, it is suitable for kinds of trace analysis of the complicated samples. For example, it is very convenient to establish proper method for extraction trace-level of androgens in human serum samples (as shown in the Figure (C)).



Figure(C). Typical reversed phase extraction method using UPE-30 cartridges to extract androgens in human serum samples

The procedure of a typical reversed phase extraction includes following five steps: conditioning column, equilibrating column, sample loading, washing out interference, and eluting target compounds. The detailed operation is described as follows:

[1] *Conditioning column*: the UPE-30 cartridge was conditioned by 0.3 mL methanol.

[2] *Equilibrating column*: the UPE-30 cartridge was equilibrated by 1 mL physiological saline solution (or pure water) at a flow rate of 2 mL/min.

[3] *Sample loading*: 1~3 mL of human serum (or plasma) sample diluted with 0.1 mol/L sodium acetate buffer (1:1, v/v) was passed through the UPE-30 cartridge at a flow rate of 1.5 mL/min.

[4] *Washing column*: 1 mL D.I. water (or pure water) was used to wash the UPE-30 cartridge to remove interference compounds. at a flow rate of 3 mL/min. Then the UPE cartridge was then dried by blowing nitrogen gas/air or via centrifuging.

[5] *Eluting target compounds*: 0.3 mL methanol was used to elute the Androgens from the UPE cartridge at flow rate of 1.5 mL/min. The elute was directly collected into 1.5-mL sample vial for direct injection into LC-MS or GC-MS for final analysis.

In the last step of “*Eluting target compounds*”, both eluting and concentrating operations were completed in one step without extra evaporating or nitrogen drying procedure. The final 0.3-mL elute was used for direct injection without further extra concentrating procedure and the target compounds Androgens were concentrated 10 times (original Androgens in 3mL serum was eluted in 0.3 mL methanol).

The above extraction method was developed basing on endogenous level of Androgens in human blood samples. Some parameters, e.g., type and volume of the final eluting solvent etc., need to be further optimized if the exogenous Androgens and their metabolites are to be extracted and analyzed.

Compared to conventional SPE Cartridges from Other Manufacturer

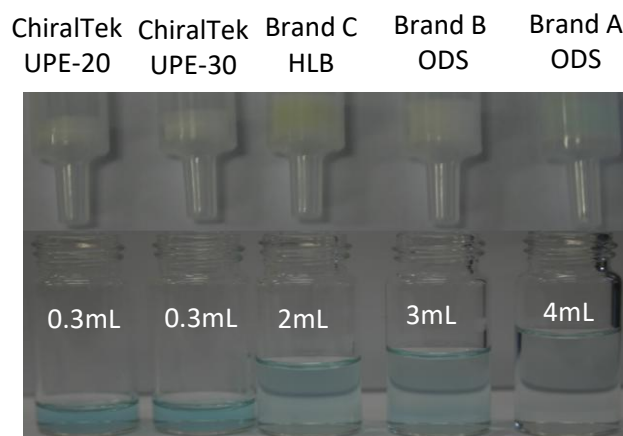
Since the UPE packing materials have much higher sample capacity, the Chiraltek UPE cartridges contain much thinner column beds and much smaller volume of the packing materials (only 5 to 10% of other traditional SPE cartridges). This results in extremely small amount of solvents needed to condition and elute the UPE cartridges. Both the eluting and concentrating operations can be completed in one step without extra heating or nitrogen drying procedure when using UPE cartridges. This makes the UPE very friendly to both environment and operators.

The ChiralTek UPE cartridges also exhibited much better recovery when compared to conventional SPE cartridges from other manufacturers. The following experiment was illustrated by the example of extraction of 1 ppm Methylene Blue in 3 mL water matrix. After being conditioned by methanol following by loading same volume of 3 mL of 1-ppm Methylene Blue solution, the color of the column beds of ChiralTek UPE, Brand A, B, C cartridges (3mL SPE cartridges) is shown in Figure (D).



Figure(D). Comparison of column bed colour of different cartridges after loading same amount of Methyl Blue samples.

After eluting ChiralTek UPE-20, UPE-30, Brand C, Brand B, and Brand A cartridges with 0.3mL, 0.3mL, 2 mL, 3mL, and 4mL of methanol respectively, the column beds and collected solutions are as shown in the following Figure (E).



Figure(E). Comparison of the different colour of column beds and collected solutions after eluting.

As shown in the above Figure, only 0.3 mL of methanol can completely elute the UPE-20 and UPE-30 cartridges. However, there were still significant amount of Methylene Blue residues trapped in the column beds of Brand C, Brand B, and Brand A cartridges even after eluting by higher amount of 2mL, 3mL, and 4mL of methanol.

The blue colour of the collected solutions from UPE-20 and UPE-30 cartridges are more obvious than others. This demonstrated that the ChiralTek UPE cartridges exhibited much better recovery and extraction yield when compared with the conventional SPE cartridges from other suppliers.

UPE Cartridges Product List

Order Information for ChiralTek Ultra-high Performance UPE Cartridges				
Product No.	Model	Specification	Remarks	Organic solvent for conditioning and final elution
880-UPE-20	UPE-20	20mg/3mL, 120Å, 50 PCs/box	Replacement for 100-200mg/3mL ODS (C18) conventional SPE cartridges	0.3mL
880-UPE-30	UPE-30	30mg/3mL, 120Å, 50 PCs/box	Replacement for 200-500mg/3mL ODS (C18) conventional SPE cartridges	0.3mL
880-UPE-60	UPE-60	60mg/6mL, 120Å, 25 PCs/box	Replacement for 500-1000mg/6mL ODS (C18) conventional SPE cartridges	1.5mL
880-UPE-90	UPE-90	90mg/6mL, 120Å, 25 PCs/box	Replacement for 1000-2000mg/6mL ODS (C18) conventional SPE cartridges	1.5mL

This manual may not be updated on time, please visit English website <http://chiraltek-column.com/Downloads.php> for downloading the latest version of full product manual and application notes for the UPE cartridges.

Please call an international phone number (+65)-93656129 to directly contact ChiralTek technical support team in Singapore. You also can call a special local phone number (+86)-95040358310 in the mainland of China to directly contact ChiralTek support team in Singapore.

Corresponding Address:

ChiralTek Pte Ltd
192 Westwood Crescent
Singapore 648559

Telephone Numbers:

International phone number: (+65)-93656129
Local hotline in the mainland of China: (+86)-95040358310

Emails:

Sales department: sales@chiraltek-column.com;
Technical Team: support@chiraltek-column.com;