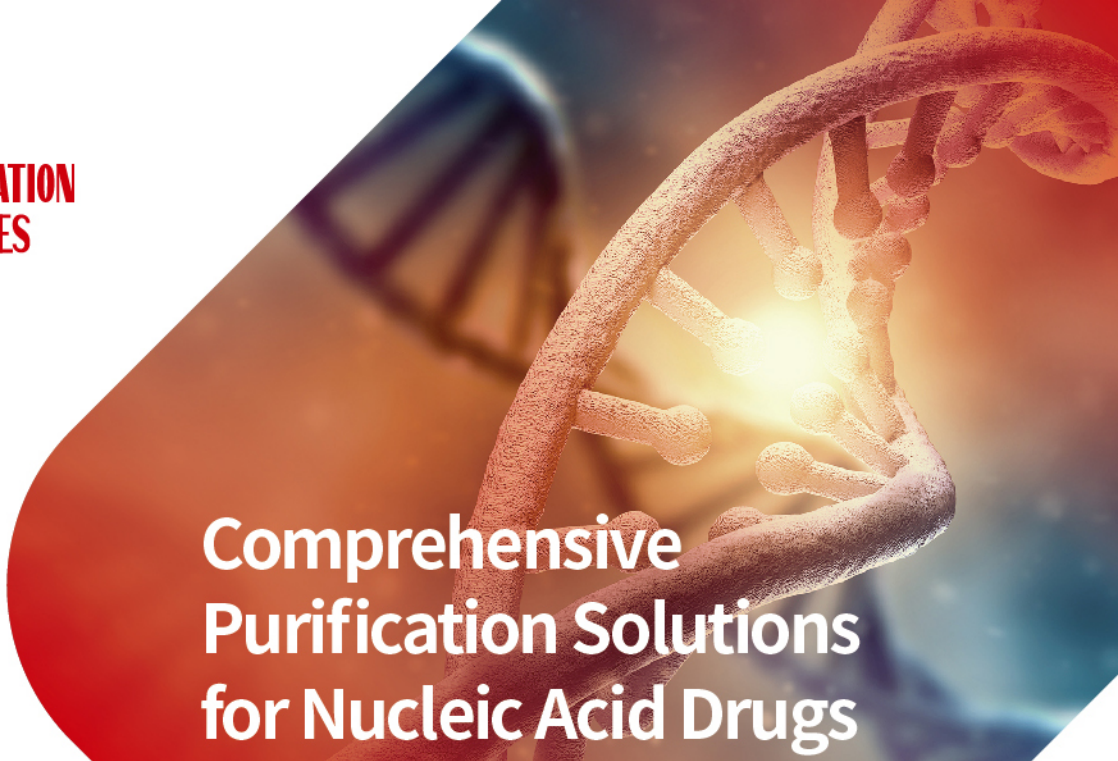
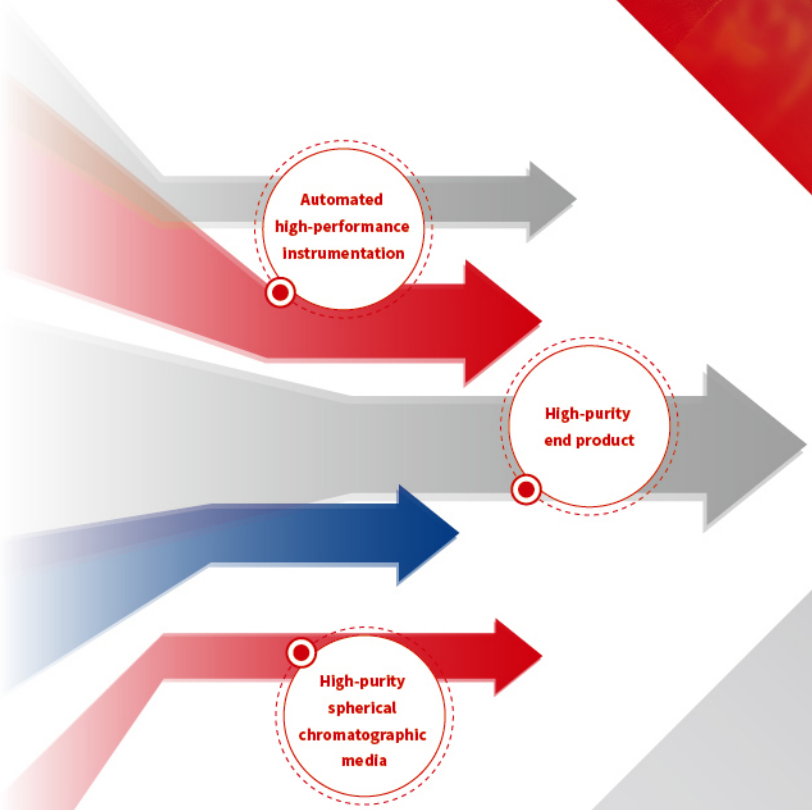
UNIFIED SEPARATION TECHNOLOGIES



Comprehensive Purification Solutions for Nucleic Acid Drugs



FOR BETTER SEPARATION

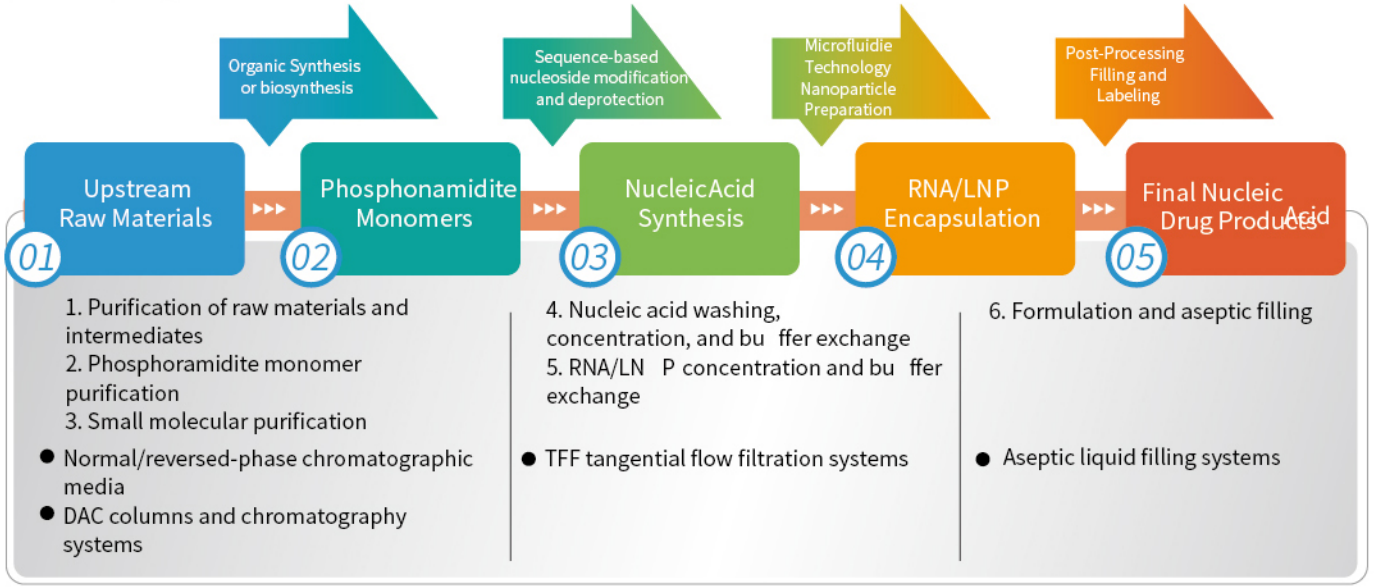
ABOUT
Unified Separation Technologies (UST)

Unified Separation Technologies (UST) is at the forefront of chromatography innovation, offering a comprehensive range of advanced solutions. Our high-quality spherical silica gel, featuring a narrow pore size distribution, is optimized for reliable chromatographic performance. Using proprietary unsymmetrical bonding technology, UST develops unique stationary phases that enhance separation efficiency. Our product portfolio includes Flash and preparative HPLC columns packed with premium materials, specialized magnetic solid-phase extraction (MSPE) products, and automated systems that streamline the mSPE process. These solutions are tailored for pharmaceutical and biopharmaceutical separation and purification, optimizing downstream processes for greater precision, efficiency, and cost-effectiveness.

With over 30 years of experience in silica chemistry and separation technologies, our founding team brings deep industry expertise. We are dedicated to delivering innovative solutions that enhance separation and purification processes in biomanufacturing. Our products are available in North America, Europe, and Asia, supporting separation and purification processes in biomanufacturing operations worldwide.

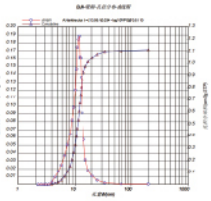
Comprehensive Purification Solutions for Nucleic Acid Drugs

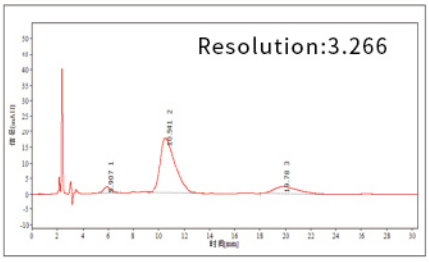
UST provides reliable purification solutions for key steps like phosphoramidite anoligonucleotide synthesis, ensuring product quality and consistency.

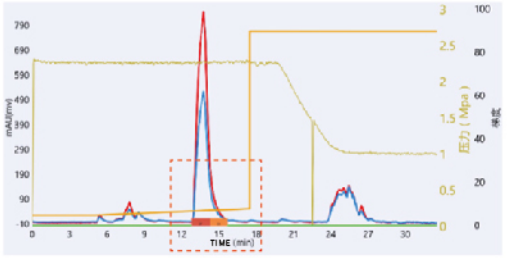


High-purity, high-strength silica nano particles with uniform pore distribution

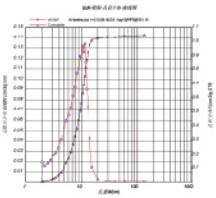
Uniform pore distribution with reduced nanopore

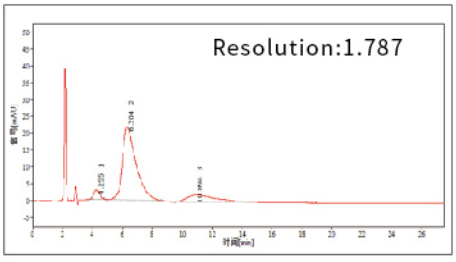


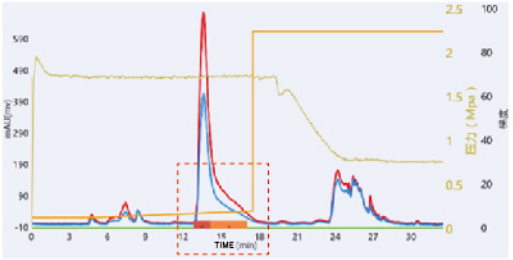




Broad pore distribution with increased nanopore







○ UST`s silica gel offers uniform pore distribution and minimal nanopores, enabling high-efficiency separation, reduced adsorption and tailing, improved yield, and strong chemical resistance.

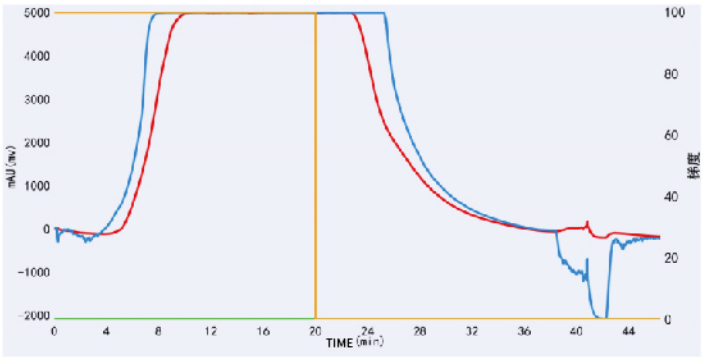
○ Asymmetric bonding technology enhances stationary phase selectivity, delivering improved separation and purification performance for structurally complex drugs

Application Cases

Phosphoramidites Purification

Phosphoramidites-Normal Phase Purification

Packing Materials	Bonnasil-BS Silica 30 μm 100 Å
Cat. No.	UBSS3302000--0
Flow Rate	4mL/min
Sample Loading	10%
Purity	99.30%
Yield	81.00%

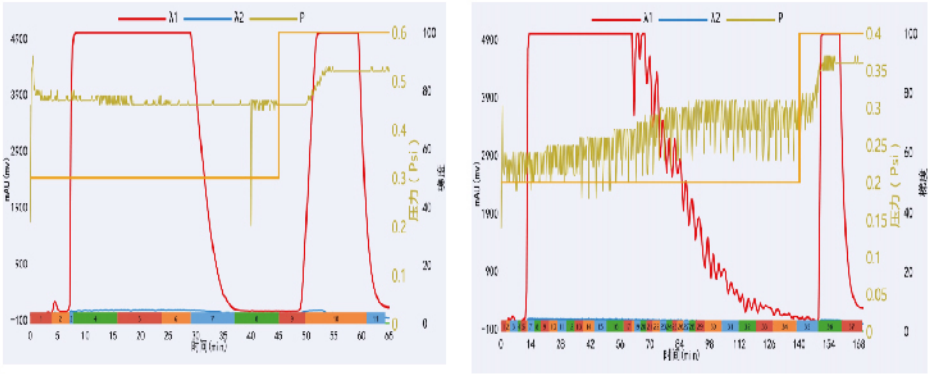


Normal-Phase Chromatogram of Phosphoramidite Purification

○ Purification Performance Across Different Silica Gels

	Bonnasil-BS Silica 30μm 100Å	Irregular Silica 200-300 mesh 100Å
Sample	Phosphoramidites	
Flow Rate	5mL/min	
Sample Loading	10%	
Time	65min	170.2min
Purity	99.57%	99.07%
Yield	82.52%	79.12%
Lifespan	≧50 injection	1 injection
Column Regeneration	Yes. One time column packing for repeated use	No. Single packing, limited to one injection, requiring frequent repacking.

Purification Chromatogram



High-purity spherical silica gel improves purity and yield; easily regenerable.

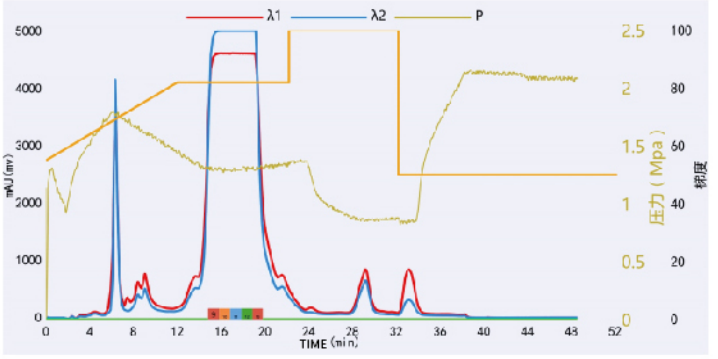
○ Spherical silica gel lowers purification costs,

Purification Process	Spherical Silica Normal Phase	Irregular Silica Normal Phase		
Silica Gel	30μm 100Å	100-200 mesh	200-300 mesh	500-800mesh
Purification Capacity	100g/kg	100g/kg	100g/kg	100g/kg
Yield	90%	80%	80%	80%
Lifespan	⩾50 injections	1 injection	1 injection	1 injection
Reagents	Dichloromethane, petroleum ether, ethyl acetate	n-Hexane, petroleum ether, ethyl acetate		
Column Regeneration	Silica can be reused multiple times	Single-use column requires frequent repacking and increases solid waste management costs.		

Phosphoramidites-Reverse Phase Purification

Phosphoramidites-Reverse Phase Purification-1

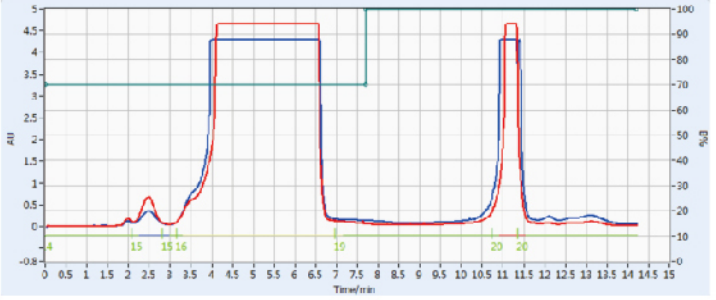
Packing Materials	Bonnasil-BS AQ C18 10 μm 120 Å
Cat. No.	UBSM102000-2
Sample Loading	1%
Flow Rate	3mL/min
Purity	99.46%
Yield	78.66%



Reverse-Phase Chromatogram of Phosphoramidite Purification

Phosphoramidites-Reverse Phase Purification-2

Packing Materials	Phosphoramidite-specific packing material (50μm, 100Å)
Cat. No.	UBPM501000-0
Sample Loading	10%
Purity	99.48%
Yield	80.4%



Reverse-Phase Chromatogram of Phosphoramidite Purification

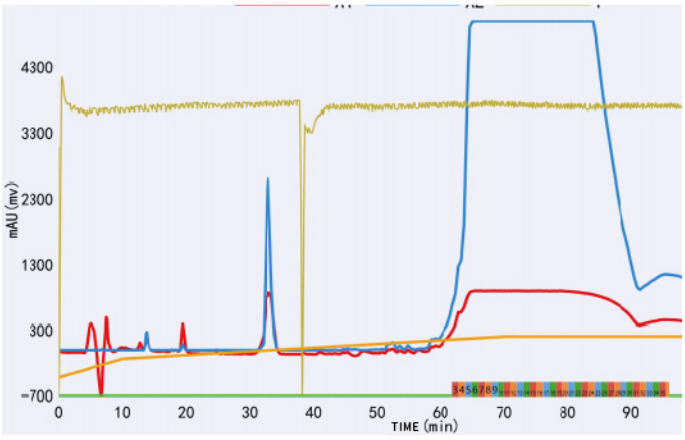
○ Advantages of Using Reverse-Phase Purification for Phosphoramidites

Packing Materials	Reverse-Phase Purifcation	TraditionalNormal Phase Purification
Yield	Phosphoramidite-specific packing material	Irregular Silica
Lifespan	80%	80%
Reagents	80-100 injections	1 injection
Column Regeneration	ACN, Water	Dichloromethane,Petroleum Ether, or Ethyl Acetate
Reagent Disposal	Yes. One time column packing for repeated use	No. Single packing, limited to one injection. requiring frequent repacking.
	Separation material supports multiple reuses withsimple acetonitrile rinsing after each cycle, resultingin a 70% reduction in reagent use and hazardouswaste disposal costs.	Produces substantial solid waste requiring storageand disposal.
Purification Cycle	300min/injection 6hrs	300min/injection 2-4hrs

Compared to irregular silica purification, reverse-phase purification lowers overall costs, enhances operational efficiency, and significantly reduces hazardous waste.

Oligo Purification

Packing Materials	Bonnasil-BS C18 Pro 8μm 120Å
Cat. No.	UBSE082000-2
Flow Rate	3mL/min
Sample Loading	1%
Purity	99.84%
Yield	78.23%



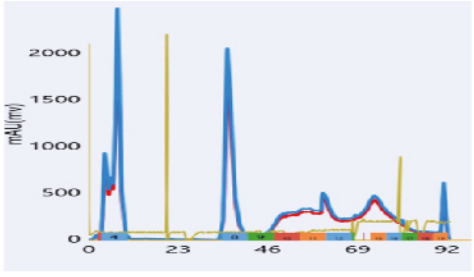
Chromatogram of Oligonucleotide Purification

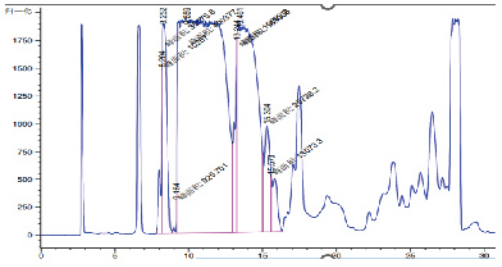
dNTP Purification

Ion Exchange → Purify Using Reverse-Phase Method → Desalt → Purified Product

Purification Steps	Ion Exchange Purification	Reverse Phase Purification
Column	Bonnasil DEAE-30 10x150mm	Bonnasil AQ C18 10μm 100Å 10x250mm
Mobile Phase	NaCl solution	A:100mmol/L Triethylamine acetate solution B: CAN:H2O=60:40
Flow Rate	2 mL/min	3 mL/min
Purity	>99%	>99%

Purification Chromatogram





○ Comparison of Packing Materials for Liposome Purification Performance

	Packing Material	Column	Packing Material Amount	Flow Rate	System Pressure	Loading Capacity	Mobile Phase	Wash Reagent	Separation Time	Life Span
Silica, Spherical /high purity	30 μm, 100 Å	10*250 mm	10.02g	3 mL/min	3.5 Bar	800 mg	n-Hexane/ ethyl acetate	ethyl acetate	140 min	10 injections
Silica, Spherical	30 μm, 100 Å	10*250 mm	10.19g	3 mL/min	3.8 Bar	800 mg	n-Hexane/ ethyl acetate	ethyl acetate	115 min	3 injection
Silica, Irregular	50 μm, 100 Å	10*250 mm	9.98g	3 mL/min	2.4 Bar	800 mg	n-Hexane/ ethyl acetate	ethyl acetate	115 min	1 injection
Silica, Irregular	30 μm, 100 Å	10*250 mm	10.11g	3 mL/min	3.5 Bar	800 mg	n-Hexane/ ethyl acetate	ethyl acetate	140 min	2 injections

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