



Oligonucleotide therapeutics

# Phosphoramidites for oligonucleotide synthesis

# Access a purpose-built portfolio of TheraPure and standard phosphoramidites

Thermo Scientific™ DNA and RNA phosphoramidites are built to meet the varying needs of oligonucleotide manufacturers for the development of therapeutic, diagnostic, and research applications. A broad range of nucleic acid chemistry options are available, including custom manufacturing and analytical services. We offer standard and Thermo Scientific™ TheraPure™ phosphoramidites, modified phosphoramidites, including 2' sugar modifications and various protection modifications, dye labeling, structural moieties, linkers, and spacers. TheraPure

phosphoramidites undergo additional quality control release testing against our standard phosphoramidites, ensuring that impurities and residual solvents are controlled to the stringent levels required by our customers for their oligo therapeutics.

## Reliable quality

- Manufactured in an ISO 9001–registered facility since 1995
- Controlled and documented processes provide consistent product quality with full traceability

Large selection of standard and TheraPure phosphoramidites.

		Base protection options						
	Base	Benzoyl (Bz)	Isobutyryl (iBu)	Isopropyl-phenoxyacetyl (IPrPAC)	Phenoxyacetyl (PAC)	Acetyl (AC)	Dimethylamino-formamide (DMF)	No base protection
DNA phosphoramidites	dA	T			S			
	dC	T	S			T		
	dG		T	S			T	
	5mC	S						
	T							T
RNA phosphoramidites	A	T						
	C					T		
	G		T			T		
	U							T
2'-OMe RNA phosphoramidites	A	T			S			
	C					T		
	G		T	S		T		
	U							T
2'-Fluoro RNA phosphoramidites	A	T						
	C					T		
	G		T					
	U							T
Locked nucleic acid phosphoramidites	A	T						
	5mC	T						
	G						T	
	T							T
2'-MOE phosphoramidites	A	T						
	5mC	T						
	G		T					
	T							T

**T** TheraPure phosphoramidites  
**S** Standard phosphoramidites

# TheraPure chemistry solutions designed for nucleic acid therapeutics

## Flexibility, rich history, and quality

### Flexible supply

- Bulk or pack sizes to fit most commercially available synthesizers are ready for prompt delivery
- Extensive manufacturing experience enables us to meet your scale-up requirements, from grams to metric tons

### Solid commitment

- Over 40 years of leadership in nucleic acid chemistry, with growing capabilities to meet market needs
- Continued development and advancement of critical analytics
- Investments in increased capacity

Originally designed specifically to meet the needs of oligonucleotide-based therapeutics development, TheraPure phosphoramidites are now important for molecular assay and gene synthesis applications, which both benefit from low levels of critical impurities.

### Control of critical impurities\*

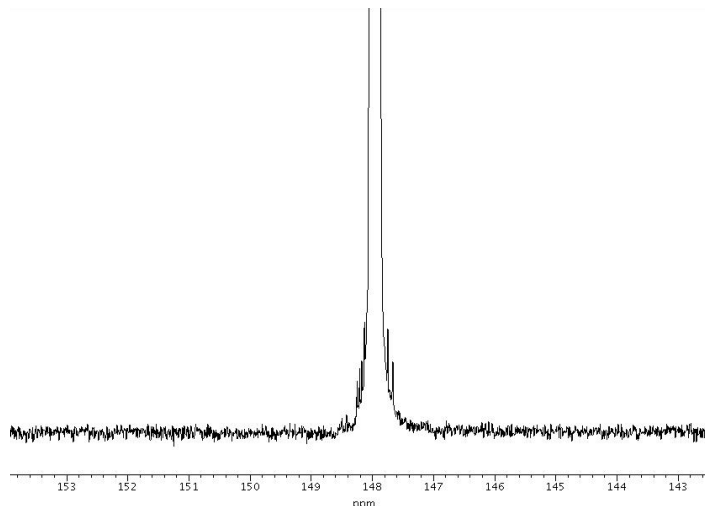
- Sum of nonprimary peaks at 140–152 ppm  $\leq 0.3\%$  to  $\leq 0.5\%$  by  $^{31}\text{P}$  NMR
- Reduced levels of noncritical impurities
- Reduced occurrence of critical impurities that can be incorporated during oligonucleotide synthesis

### Control of residual solvents and water content\*

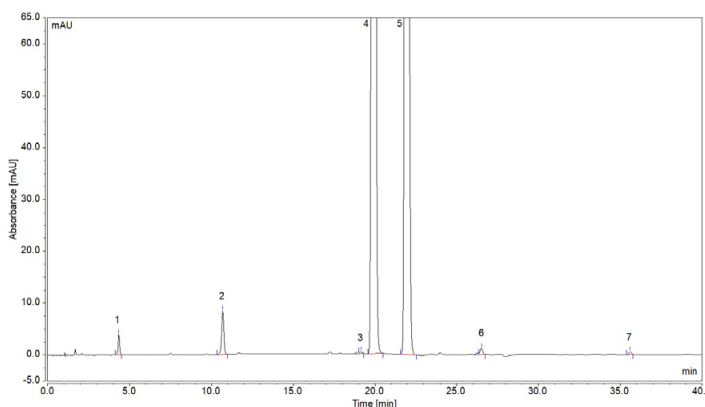
- Low residual solvents
- Low water content, which enables higher coupling efficiency and solution stability

### Security of supply

- Multiple sources of critical raw materials
- Long-term supplier agreements, including access to safety stock and change notification



Typical  $^{31}\text{P}$  NMR scan of a TheraPure RNA phosphoramidite.



Example of impurity profile of TheraPure 2'-TBDMS-iBU-rG Phosphoramidite by LC-MS.

Peak	Area (%)	Mass spec identification	Impurity classification
1	0.11	Protected nucleoside	Nonreactive, noncritical
2	0.35	5'-DMTr-3'-H-phosphonoamidate	Nonreactive, noncritical
3	0.02	Dimer CE-phosphite	Nonreactive, noncritical
4, 5	99.3	DNA amidite	Product
6	0.06	5',3'-Di-DMTr nucleoside	Nonreactive, noncritical
7	0.03	Bis amidite	Reactive, critical

\* For a representative Certificate of Analysis, please contact our customer support or business development team.

# 2'-modified RNA phosphoramidites

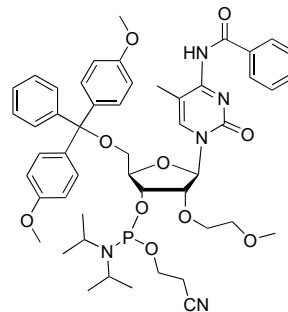
2'-modified phosphoramidites	Base				
	A	C	G	T	U
2'-MOE	2'-MOE-Bz-A CEP	2'-MOE-Bz-5mC CEP	2'-MOE-iBu-G CEP	2'-MOE-T CEP	
2'-Fluoro	2'-Fluoro-Bz-A CEP	2'-Fluoro-Ac-C CEP	2'-Fluoro-iBu-G CEP		2'-Fluoro-U CEP
2'-OMe	2'-OMe-Bz-A CEP	2'-OMe-Ac-C CEP	2'-OMe-iBu-G CEP		2'-OMe-U CEP
	2'-OMe-PAC-A CEP		2'-OMe-Ac-G CEP		
			2'-OMe-iPrPAC-G CEP		

## Key components of oligonucleotides designed for antisense, siRNA, aptamer, or gRNA-based applications

### TheraPure 2'-MOE Phosphoramidites

2'-O-methoxyethyl (MOE) modification offers:

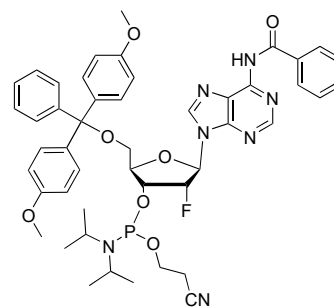
- Nuclease resistance
- Fewer off-target effects
- Increased hybridization affinities



### TheraPure 2'-Fluoro Phosphoramidites

2'-Fluoro modification offers:

- Nuclease resistance
- Increased thermal stability of RNA duplexes

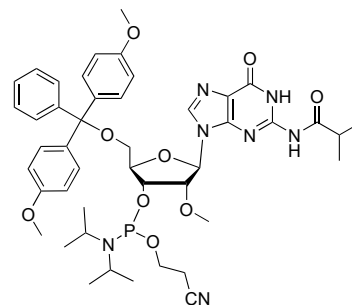


### TheraPure 2'-OMe Phosphoramidites

2'-O-methyl (OMe) modification offers:

- Nuclease resistance
- Fewer off-target effects
- Increased hybridization affinities

PAC-A and iPrPAC-G are available for fast deprotection.



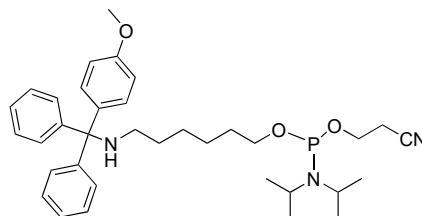


# Linker and spacer phosphoramidites

Put your oligonucleotides to work through 5' end modifications.

## Amino modifiers

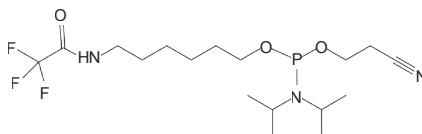
- Suitable for attachment of amine-reactive entities, including fluorescent labels, tags, and other molecules
- Offered with MMT or TFA protection



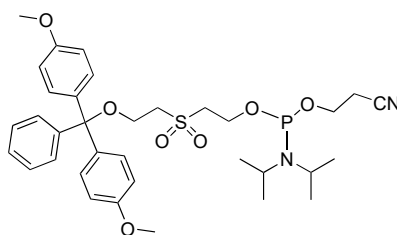
5'-aminohexyl linker phosphoramidite

## Phosphorylation

- Increased stability; suitable for ligation applications
- Incorporation of phosphate group to 5' position of oligonucleotide



TFA amino linker phosphoramidite



Phosphorylating phosphoramidite

# Custom nucleic acid chemistry

Our proven custom product development process is built to efficiently and effectively respond to your specific needs.

## Advanced project management

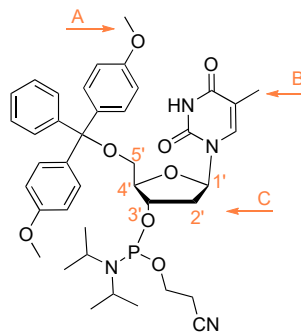
- Customer involvement
- Dedicated cross-functional project team
- Project planning and execution tailored to each custom request
- Manufactured in an ISO 9001–registered facility
- Thoroughly documented processes provide consistent product quality with batch-to-batch consistency

## Custom chemistries and capabilities

- Chemistries: phosphoramidite and custom organics
- Modifiers and linkers
- R&D to large-scale manufacturing
- Development of customized QC
- Customer-driven specifications
- Custom filling, labeling, and packaging

## Customization options

- Base or base protection modification
- Sugar modifications
- Changes to phosphitylation, or phosphitylation of custom molecules
- 5' protection modification



- A. Dimethoxytrityl (DMT) substitution with alternate protecting groups
- B. Base = A, C, G, T, or U protection modifications or base modifications
- C. Sugar modifications and protection options

## Ordering information

Product	Cat. No.
<b>TheraPure DNA phosphoramidites</b>	
TheraPure dA β-Cyanoethyl Phosphoramidite	27-2030
TheraPure dC β-Cyanoethyl Phosphoramidite	27-2032
TheraPure dG β-Cyanoethyl Phosphoramidite	27-2034
TheraPure DMF-dG Phosphoramidite	27-1737
TheraPure dT β-Cyanoethyl Phosphoramidite	27-2036
<b>TheraPure RNA phosphoramidites</b>	
TheraPure Bz-rA Phosphoramidite	27-1903
TheraPure Ac-rC Phosphoramidite	27-1805
TheraPure iBu-rG Phosphoramidite	27-1906
TheraPure rU Phosphoramidite	27-1804
<b>TheraPure 2'-OMe phosphoramidites</b>	
TheraPure 2'-OMe-Bz-A Phosphoramidite	27-2042
TheraPure 2'-OMe-Ac-C Phosphoramidite	27-2043
TheraPure 2'-OMe-iBu-G Phosphoramidite	27-2046
TheraPure 2'-OMe-U Phosphoramidite	27-2044
<b>TheraPure 2'-MOE phosphoramidites</b>	
TheraPure 2'-MOE-A Phosphoramidite	27-1019
TheraPure 2'-MOE-5mC Phosphoramidite	27-1020
TheraPure 2'-MOE-G Phosphoramidite	27-1022
TheraPure 2'-MOE-T Phosphoramidite	27-1021
<b>TheraPure 2'-fluoro phosphoramidites</b>	
TheraPure 2'-Fluoro-Bz-A Phosphoramidite	27-1601
TheraPure 2'-Fluoro-Acetyl-C Phosphoramidite	27-1604
TheraPure 2'-Fluoro-iBu-G Phosphoramidite	27-1607
TheraPure 2'-Fluoro-U Phosphoramidite	27-1602
<b>Fast deprotect DNA phosphoramidites</b>	
PAC-dA Phosphoramidite	27-1723
iPrPAC-dG Phosphoramidite	27-1726
iBu-dC Phosphoramidite	27-1725
Ac-dC Phosphoramidite	29-1727
TheraPure DMF-dG Phosphoramidite	27-1737
<b>Structural phosphoramidites</b>	
dU Phosphoramidite	27-1738
dI Phosphoramidite	27-1744
N6-Me-dA Phosphoramidite	27-1746
5-Me-dC Phosphoramidite	27-1748
N4-Ethyl-dC Phosphoramidite	27-1743

Product	Cat. No.
<b>TheraPure locked nucleic acids</b>	
TheraPure Locked Nucleic Acid A (Bz) Phosphoramidite	27-1340
TheraPure Locked Nucleic Acid 5-Me-C (Bz) Phosphoramidite	27-1348
TheraPure Locked Nucleic Acid G (DMF) Phosphoramidite	27-1347
TheraPure Locked Nucleic Acid T Phosphoramidite	27-1346
<b>Standard DNA phosphoramidites</b>	
dA β-Cyanoethyl Phosphoramidite	27-1730
dC β-Cyanoethyl Phosphoramidite	27-1732
dG β-Cyanoethyl Phosphoramidite	27-1734
T β-Cyanoethyl Phosphoramidite	27-1736
<b>Standard RNA phosphoramidites</b>	
Bz-rA Phosphoramidite	27-1403
Ac-rC Phosphoramidite	27-1405
iBu-rG Phosphoramidite	27-1406
rU Phosphoramidite	27-1404
<b>Standard 2'-OMe phosphoramidites</b>	
2'-OMe-PAC-A Phosphoramidite	27-1822
2'-OMe-iPrPAC-G Phosphoramidite	27-1826
2'-OMe-Bz-A β-Cyanoethyl Phosphoramidite	27-1842
2'-OMe-Ac-C β-Cyanoethyl Phosphoramidite	27-1823
2'-OMe-iBu-G β-Cyanoethyl Phosphoramidite	27-1846
2'-OMe-U β-Cyanoethyl Phosphoramidite	27-1825
<b>DyLight dye-labeled phosphoramidites</b>	
DyLight DY547 Phosphoramidite	SY6332
DyLight DY647 Phosphoramidite	SY6334
DyLight DY677 Phosphoramidite	SY6336
<b>Linkers/spacers/5'-modifier phosphoramidites</b>	
5'-Aminohexyl Linker Phosphoramidite	27-0035
TFA Amino Linker Phosphoramidite	27-1792
Phosphorylating Phosphoramidite	27-1794
Reverse Abasic Phosphoramidite	27-1998



Make us a part of your team—contact a nucleic acid therapeutics business development manager at [thermofisher.com/amiditerequest](https://thermofisher.com/amiditerequest)

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