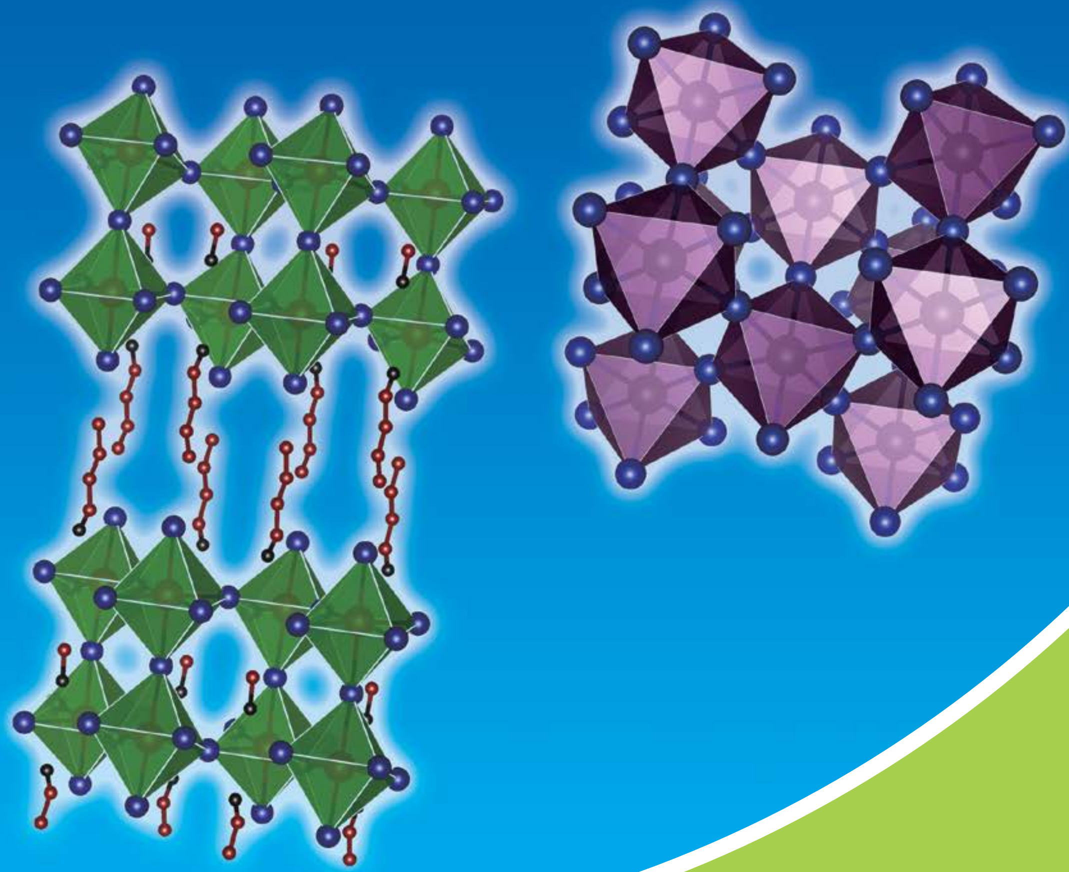
MATERIALS

Organic-Inorganic Perovskite Precursors



Organic Onium Salts

Lead Halides

Other Lead Compounds

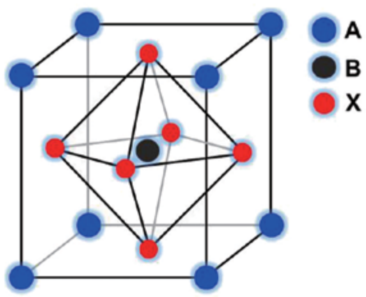
Cesium Halides

Bismuth Halides

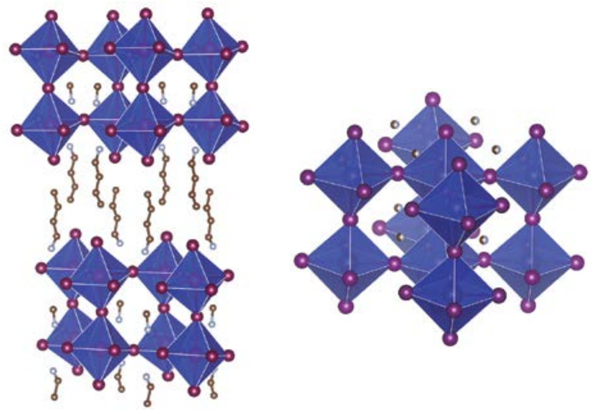
Tin Halides

Organic-Inorganic Perovskite Precursors

"Perovskite" originates from the mineral name of calcium titanate ($CaTiO_3$) and the compounds with formula of ABX_3 generally belong to a perovskite-type compound, where the A is a divalent and B is a tetravalent metal ion. A perovskite with cubic or orthorhombic phases shows ferroelectricity, for instance, barium titanate ($BaTiO_3$) is a ferroelectric or piezoelectric material.[1)] High temperature superconductive oxides with a unit of copper oxide are obtained from all perovskite compounds.[2)] These perovskite compounds consist of metal ions and oxygen atoms, and are manufactured by a physical procedure (eg. sintering method).[3)] Modification of the metal ion and a changing ratio of the metal ion components can drastically control physical properties of the perovskite. In addition to the oxide perovskites, halide-based perovskites are also well known.



On the other hand, one can replace the cationic component with an organic ammonium at the A site. In this case, a chemical method can provide a perovskite compound. This perovskite compound is called an "organic-inorganic perovskite compound", because it contains an organic component. A metal ion component usually involves tin or lead.[4,5)] This perovskite compound has the general formula $[(RNH_3)_mMX_n]$, in which modifications of metal (M), halide (X) and organic groups (R) precisely control physical properties. Among them, the tin perovskite is relatively better for electrical conduction,[6)] and the lead one is better for optical properties.[7)] A chemical modification of the halide controls band gap.[8)] Selection of organic onium halide, metal halide and their mixing ratio changes the component ratio of the halide. The organic groups are selected from methyl, long alkyls, phenyl, benzyl, phenethyl and so on. Diversity of these organic groups allows controlling the structure of a perovskite compound. For instance, a perovskite compound with R = methyl provides $[(MeNH_3)MX_3]$ having a three-dimensional cubic perovskite structure.[9)] A perovskite compound with R = C_nH_{2n+1} ($n \geq 2$) provides a two-dimensional perovskite layer and the length of alkyl group can control the inter-layer distance.[10)]



An application of an organic-inorganic perovskite is a perovskite solar cell.[11-15)] This solar cell can usually be fabricated by the three-dimensional cubic perovskite $[(MeNH_3)MX_3]$. Doping effects of formamidinium[16)] and cesium cations[17)] to the A site were also investigated for the perovskite solar cell research. Research on the perovskite solar cell recently received much attention. Power conversion efficiency of this solar cell is more than those of organic photovoltaics (OPV) and dye-sensitized solar cells (DSSC), and the device can be fabricated by a solution method at low cost.

References

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Organic Onium Salts

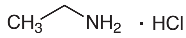
Chloride Salts

M0138 25g 500g

$CH_3NH_2 \cdot HCl$

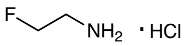
Methylamine Hydrochloride
CAS RN: 593-51-1

E0205 25g 500g



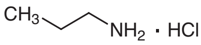
Ethylamine Hydrochloride
CAS RN: 557-66-4

F1250 1g 5g



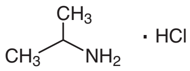
2-Fluoroethylamine Hydrochloride
CAS RN: 460-08-2

P0522 25g



Propylamine Hydrochloride
CAS RN: 556-53-6

I0166 25g 100g 500g



Isopropylamine Hydrochloride
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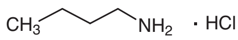
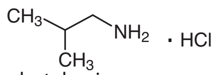
B0710 25g 500g



Butylamine Hydrochloride
CAS RN: 3858-78-4

I0096 25g 500g



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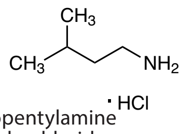
CAS RN: 5041-09-8

I0083 1g 5g



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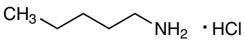
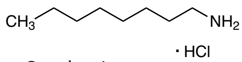


Pentylamine Hydrochloride
CAS RN: 142-65-4

O0484 1g 5g



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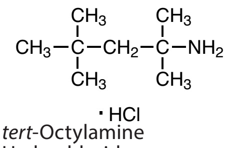
CAS RN: 142-95-0

T3784 1g 5g



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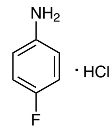
CAS RN: 58618-91-0

F1271 5g 25g



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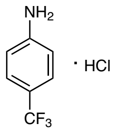
T3833 1g 5g



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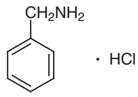
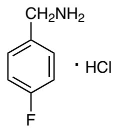


Benzylamine Hydrochloride
CAS RN: 3287-99-8

F1255 1g 5g



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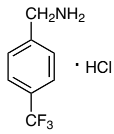
T3836 1g 5g



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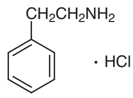

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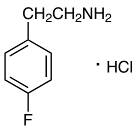
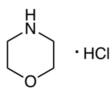


2-(4-Fluorophenyl)-ethylamine Hydrochloride
CAS RN: 459-19-8

M3284 5g 25g



Morpholine Hydrochloride
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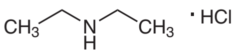
D0468 25g 500g



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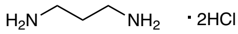

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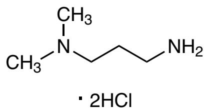
CAS RN: 10517-44-9

D5617 1g 5g



N,N-Dimethyl-1,3-propanediamine Dihydrochloride
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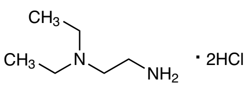
D5860 5g



N,N-Diethylethylenediamine Dihydrochloride
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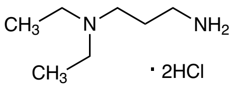

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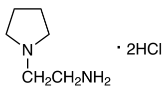

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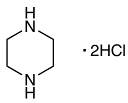

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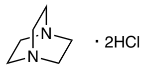

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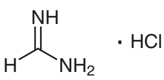

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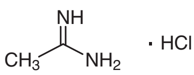

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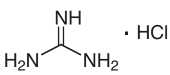
G0162 25g 500g



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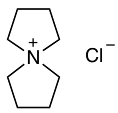

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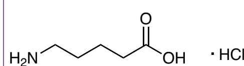


5-Aminovaleric Acid Hydrochloride
(Low water content)
CAS RN: 627-95-2

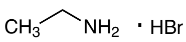
Bromide Salts

M2589 1g 5g 25g

$CH_3NH_2 \cdot HBr$

Methylamine Hydrobromide
(Low water content)
CAS RN: 6876-37-5

E0056 25g 500g



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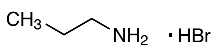

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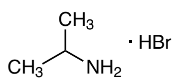

Isopropylamine Hydrobromide
CAS RN: 29552-58-7

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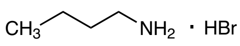
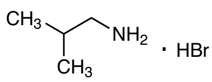
B5186 1g 5g

Butylamine Hydrobromide
CAS RN: 15567-09-6

I1007 1g 5g

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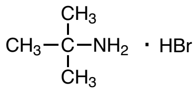
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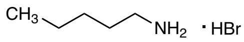
CAS RN: 60469-70-7

P2739 1g 5g

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CAS RN: 7334-94-3

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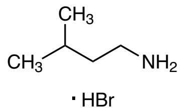
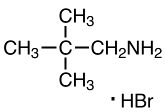

Isopentylamine Hydrobromide

N1156 1g 5g

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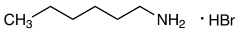
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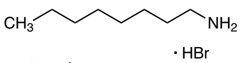
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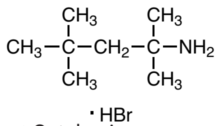
T3783 1g 5g

tert-Octylamine Hydrobromide
CAS RN: 1093859-61-0

D5537 1g 5g
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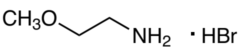
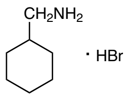
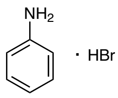
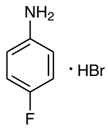
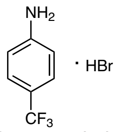
Dodecylamine Hydrobromide
CAS RN: 26204-55-7

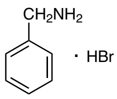
M3287 1g 5g

2-Methoxyethylamine Hydrobromide
CAS RN: 663941-77-3

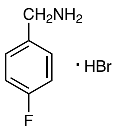
C3531 1g 5g

Cyclohexanemethylamine Hydrobromide

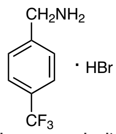
A2985 1g 5g

Aniline Hydrobromide
CAS RN: 542-11-0

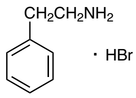
F1272 5g 25g

4-Fluoroaniline Hydrobromide
CAS RN: 85734-18-5

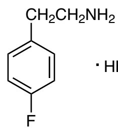
T3834 1g 5g

4-(Trifluoromethyl)aniline Hydrobromide
CAS RN: 148819-81-2

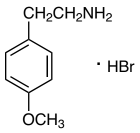
B5185 1g 5g

Benzylamine Hydrobromide
CAS RN: 37488-40-7

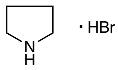
F1227 1g 5g

4-Fluorobenzylamine Hydrobromide
CAS RN: 2270172-94-4

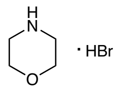
T3837 1g 5g

4-(Trifluoromethyl)-benzylamine Hydrobromide

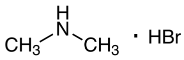
P2388 1g 5g

2-Phenylethylamine Hydrobromide
CAS RN: 53916-94-2

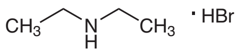
F1229 1g 5g

4-Fluorophenethylamine Hydrobromide
CAS RN: 1807536-06-6

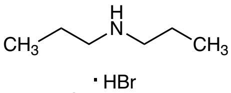
M3239 1g 5g

2-(4-Methoxyphenyl)-ethylamine Hydrobromide

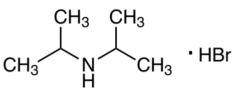
P2484 1g 5g

Pyrrolidine Hydrobromide
CAS RN: 55810-80-5

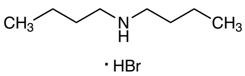
M3285 5g 25g

Morpholine Hydrobromide
CAS RN: 6377-82-8

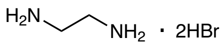
D5092 1g 5g

Dimethylamine Hydrobromide
CAS RN: 6912-12-5

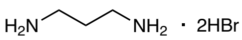
D4667 1g 5g

Diethylamine Hydrobromide
CAS RN: 6274-12-0

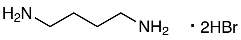
D5853 5g

Dipropylamine Hydrobromide
CAS RN: 7334-96-5

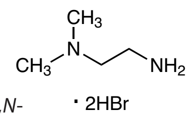
D5768 5g

Diisopropylamine Hydrobromide
CAS RN: 30321-74-5

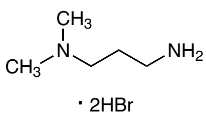
D5857 5g

Dibutylamine Hydrobromide
CAS RN: 10435-44-6

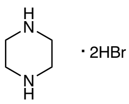
E1221 1g 5g

Ethylenediamine Dihydrobromide
CAS RN: 624-59-9

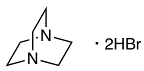
D5090 1g 5g

1,3-Diaminopropane Dihydrobromide
CAS RN: 18773-03-0

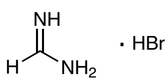
D5685 1g 5g

1,4-Diaminobutane Dihydrobromide
CAS RN: 18773-04-1

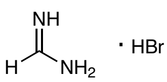
D5615 1g 5g

N,N-Dimethylethylenediamine Dihydrobromide
CAS RN: 1245570-04-0

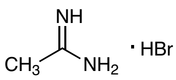
D5618 1g 5g

3-(Dimethylamino)-propylamine Dihydrobromide

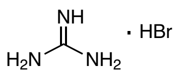
P2490 1g 5g

Piperazine Dihydrobromide
CAS RN: 59813-05-7

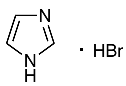
D5250 1g 5g

1,4-Diazabicyclo[2.2.2]-octane Dihydrobromide
CAS RN: 54581-69-0

F0973 1g 5g 25g

Formamidine Hydrobromide
(Low water content)
CAS RN: 146958-06-7

F1244 1g 5g 25g

FABr
(99.99%, trace metals basis)
CAS RN: 146958-06-7

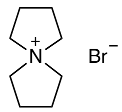
A3292 1g 5g

Acetamidine Hydrobromide
CAS RN: 1040352-82-6

G0449 1g 5g

Guanidine Hydrobromide
CAS RN: 19244-98-5

I1006 1g 5g

Imidazole Hydrobromide
(Low water content)
CAS RN: 101023-55-6

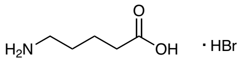
Please inquire for pricing and availability of listed products to our local sales representatives.

A3091 1g 5g



5-Azoniaspiro[4.4]nonane Bromide
CAS RN: 16450-38-7

A3094 1g 5g



5-Aminovaleric Acid Hydrobromide
(Low water content)
CAS RN: 2173111-73-2

Iodide Salts

M2556 1g 5g 25g 100g

$CH_3NH_2 \cdot HI$

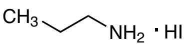
Methylamine Hydroiodide
(Low water content)
CAS RN: 14965-49-2

E1045 1g 5g

$CH_3CH_2NH_2 \cdot HI$

Ethylamine Hydroiodide
CAS RN: 506-58-1

P2212 1g 5g



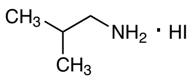
Propylamine Hydroiodide
CAS RN: 14488-45-0

B4433 1g 5g

$CH_3(CH_2)_3NH_2 \cdot HI$

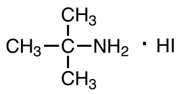
Butylamine Hydroiodide
CAS RN: 36945-08-1

I0935 1g 5g



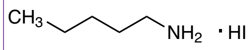
Isobutylamine Hydroiodide
CAS RN: 205508-75-4

B4434 1g 5g



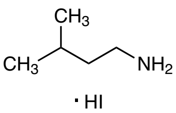
tert-Butylamine Hydroiodide
CAS RN: 39557-45-4

P2740 1g 5g



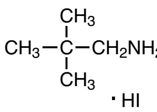
Pentylamine Hydroiodide
CAS RN: 60762-85-8

I1095 1g 5g



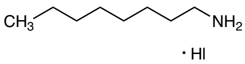
Isopentylamine Hydroiodide

N1157 1g 5g



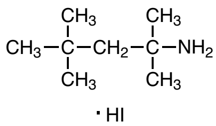
Neopentylamine Hydroiodide

O0485 1g 5g



n-Octylammonium Iodide
CAS RN: 60734-63-6

T3785 1g 5g



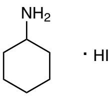
tert-Octylamine Hydroiodide

D5538 1g 5g

$CH_3(CH_2)_{11}NH_2 \cdot HI$

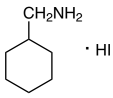
Dodecylamine Hydroiodide
CAS RN: 34099-97-3

C3532 1g 5g



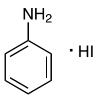
Cyclohexylamine Hydroiodide
CAS RN: 45492-87-3

C3425 1g 5g



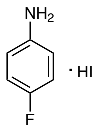
Cyclohexanemethylamine Hydroiodide
CAS RN: 2153504-15-3

A2778 1g 5g



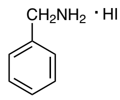
Aniline Hydroiodide
CAS RN: 45497-73-2

F1273 1g 5g



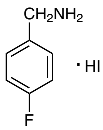
4-Fluoroaniline Hydroiodide
CAS RN: 85734-19-6

B4566 1g 5g



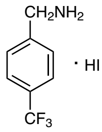
Benzylamine Hydroiodide
(Low water content)
CAS RN: 45579-91-7

F1228 1g 5g



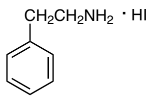
4-Fluorobenzylamine Hydroiodide
CAS RN: 2097121-30-5

T3838 1g 5g



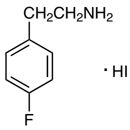
4-(Trifluoromethyl)-benzylamine Hydroiodide

P2213 1g 5g



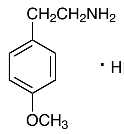
2-Phenylethylamine Hydroiodide
CAS RN: 151059-43-7

F1203 1g 5g



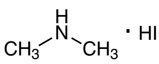
2-(4-Fluorophenyl)-ethylamine Hydroiodide
CAS RN: 1413269-55-2

M3240 1g 5g



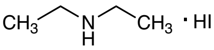
2-(4-Methoxyphenyl)-ethylamine Hydroiodide

D4555 1g 5g



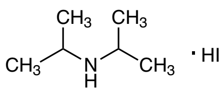
Dimethylamine Hydroiodide
CAS RN: 51066-74-1

D4643 1g 5g



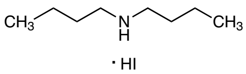
Diethylamine Hydroiodide
CAS RN: 19833-78-4

D5769 5g



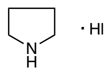
Diisopropylamine Hydroiodide
CAS RN: 132396-99-7

D5858 5g



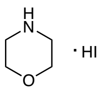
Dibutylamine Hydroiodide
CAS RN: 79886-80-9

P2486 1g 5g



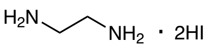
Pyrrolidine Hydriodide
CAS RN: 45361-12-4

M3286 5g 25g



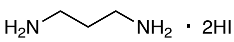
Morpholine Hydroiodide
CAS RN: 58464-45-2

E1222 1g 5g



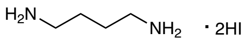
Ethylenediamine Dihydroiodide
CAS RN: 5700-49-2

D5091 1g 5g



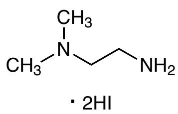
1,3-Diaminopropane Dihydroiodide
CAS RN: 120675-53-8

D5686 1g 5g



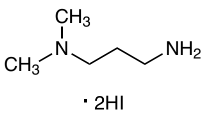
1,4-Diaminobutane Dihydroiodide
CAS RN: 916849-52-0

D5616 1g 5g



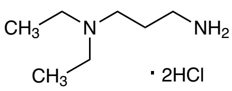
N,N-Dimethylethylenediamine Dihydroiodide
CAS RN: 244234-52-4

D5619 1g 5g



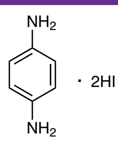
N,N-Dimethyl-1,3-propanediamine Dihydroiodide

D5861 5g



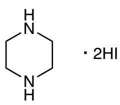
3-(Dimethylamino)-propylamine Dihydroiodide
CAS RN: 99310-71-1

P2389 1g



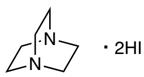
1,4-Phenylenediamine Dihydroiodide
CAS RN: 116469-02-4

P2492 1g 5g

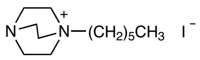


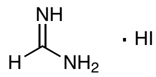
Piperazine Dihydriodide
CAS RN: 58464-47-4

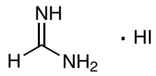
D5252 1g 5g

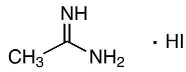


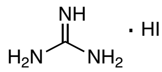
1,4-Diazabicyclo[2.2.2]-octane Dihydriodide
CAS RN: 33322-06-4

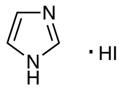
H1759 5g

1-Hexyl-1,4-diazabicyclo[2.2.2]octan-1-ium Iodide
CAS RN: 1009321-13-4

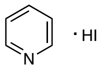
F0974 1g 5g 25g

Formamidine Hydroiodide
(Low water content)
CAS RN: 879643-71-7

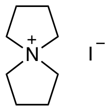
F1263 1g 5g 25g

Formamidine Hydroiodide
(99.99%, trace metals basis)
CAS RN: 879643-71-7

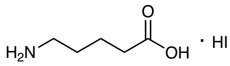
A2902 1g 5g

Acetamidine Hydroiodide
(Low water content)
CAS RN: 1452099-14-7

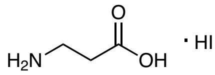
G0450 1g 5g

Guanidine Hydroiodide
CAS RN: 19227-70-4

I0970 1g 5g

Imidazole Hydroiodide
(Low water content)
CAS RN: 68007-08-9

P2672 5g

Pyridine Hydroiodide
CAS RN: 18820-83-2

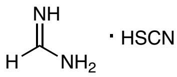
A3093 1g 5g

5-Azoniaspiro[4.4]nonane Iodide
CAS RN: 45650-35-9

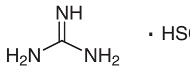
A2984 1g 5g

5-Aminovaleric Acid Hydroiodide
(Low water content)
CAS RN: 1705581-28-7

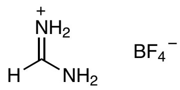
A3112 1g 5g

β-Alanine Hydroiodide
(Low water content)
CAS RN: 2096495-59-7

Pseudo Halide Salts

M2991 1g 5g
$CH_3NH_2 \cdot HSCN$
Methylamine Thiocyanate
CAS RN: 61540-63-4

F1153 1g 5g

Formamidine Thiocyanate
CAS RN: 1821033-48-0

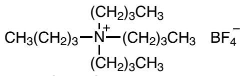
G0230 25g 500g

Guanidine Thiocyanate
CAS RN: 593-84-0

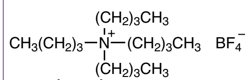
F1152 1g 5g

Formamidinium Tetrafluoroborate

M2990 1g 5g
$CH_3NH_3^+ \quad BF_4^-$
Methylamine Tetrafluoroborate
CAS RN: 42539-74-2

M2989 1g 5g
$CH_3NH_3^+ \quad PF_6^-$
Methylammonium Hexafluorophosphate
CAS RN: 28302-50-3

M3134 1g 5g
$CH_3NH_2 \cdot HOCN$
Methylamine Cyanate
CAS RN: 63405-91-4

T0914 25g 100g 500g

Tetrabutylammonium Tetrafluoroborate
CAS RN: 429-42-5

T2648 25g

Tetrabutylammonium Tetrafluoroborate
(Br <0.02 %)
CAS RN: 429-42-5

Lead Halides

L0279 1g 5g 25g 100g 1kg
PbI_2
Lead(II) Iodide
(99.99%, trace metals basis)
[for Perovskite precursor]
CAS RN: 10101-63-0

L0288 1g 5g 25g
$PbBr_2$
Lead(II) Bromide
[for Perovskite precursor]
CAS RN: 10031-22-8

L0346 1g 5g
$PbBr_2$
Lead(II) Bromide
(Low water content)
[for Perovskite precursor]
CAS RN: 10031-22-8

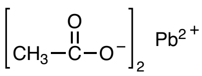
L0291 1g 5g
$PbCl_2$
Lead(II) Chloride
(purified by sublimation)
[for Perovskite precursor]
CAS RN: 7758-95-4

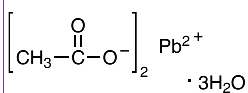
L0292 1g 5g 25g
$PbCl_2$
Lead(II) Chloride
[for Perovskite precursor]
CAS RN: 7758-95-4

C3569 1g 5g
$CsPbBr_3$
Cesium Lead Tribromide
(Low water content)
CAS RN: 15243-48-8

C3570 1g 5g
$CsPbI_3$
Cesium Lead Triiodide
(Low water content)
CAS RN: 18041-25-3

Other Lead Compounds

L0315 1g 5g 25g

Lead(II) Acetate
[for Perovskite precursor]
CAS RN: 301-04-2

L0330 25g 100g

Lead(II) Acetate Trihydrate
CAS RN: 6080-56-4

Cesium Halides

C2202 25g 100g
$CsBr$
Cesium Bromide
CAS RN: 7787-69-1

C2203 25g 100g
$CsCl$
Cesium Chloride
CAS RN: 7647-17-8

C2205 25g
CsI
Cesium Iodide
CAS RN: 7789-17-5

Bismuth Halides

B5787 5g 25g

BiI_3

Bismuth(III) Iodide Anhydrous
CAS RN: 7787-64-6

Tin Halides

T3449 1g 5g

SnI_2

Tin(II) Iodide
[for Perovskite precursor]
CAS RN: 10294-70-9

T3570 1g 5g

$SnCl_2$

Tin(II) Chloride
[for Perovskite precursor]
CAS RN: 7772-99-8

T3573 1g 5g

$SnBr_2$

Tin(II) Bromide
[for Perovskite precursor]
CAS RN: 10031-24-0

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