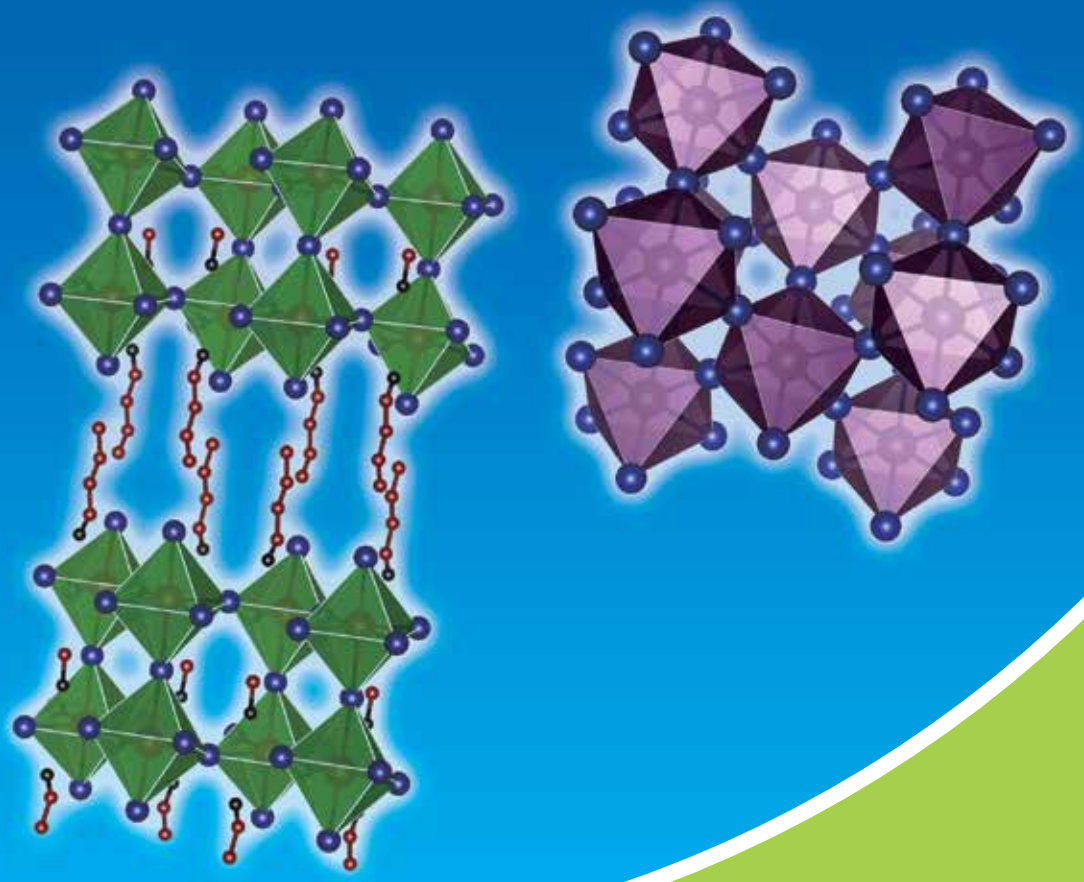
MATERIALS

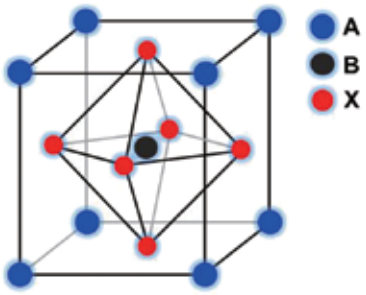
Organic-Inorganic Perovskite Precursors



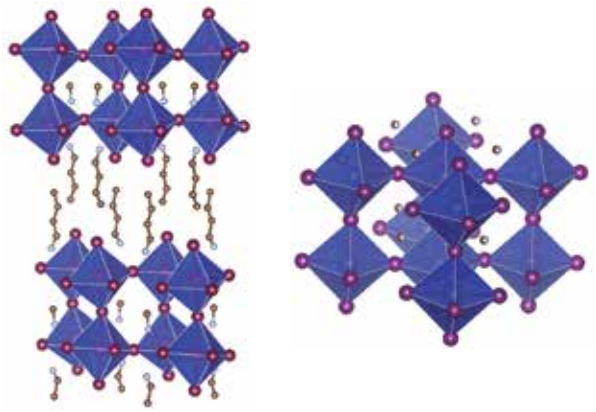
- Lead Halides
- Other Lead Compounds
- Cesium Halides
- Bismuth Halides
- Tin Halides
- Organic Onium Salts

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. Wakamiya *et al*. recently developed a ready-to-use perovskite precursor, $MeNH_3I/PbI_2$-DMF complex, enabling us to fabricate a well-uniformed crystalline film by a solution method.[18] 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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2) Y. Tokura, H. Takagi, S. Uchida, *Nature* **1989**, *337*, 345.
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Lead Halides

P2415 1g 5g 25g

$CH_3NH_3PbI_3$ / DMF

PbI_2/MAI(1:1) - DMF Complex (99.99%, trace metals basis)

L0279 1g 5g 25g 100g 1kg

PbI_2

Lead(II) Iodide
(99.99%, trace metals basis)
CAS RN: 10101-63-0

L0288 1g 5g 25g

$PbBr_2$

Lead(II) Bromide
CAS RN: 10031-22-8

L0291 1g 5g

$PbCl_2$

Lead(II) Chloride
(purified by sublimation)
CAS RN: 7758-95-4

L0292 1g 5g 25g

$PbCl_2$

Lead(II) Chloride
CAS RN: 7758-95-4

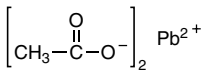
C3569 1g 5g

$CsPbBr_3$

Cesium Lead Tribromide
(Low water content)
CAS RN: 15243-48-8

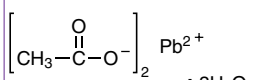
Other Lead Compounds

L0315 1g 5g 25g



Acetic Acid Lead(II) Salt
CAS RN: 301-04-2

L0330 25g 100g



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

Cesium Halides

C2205 25g

CsI

Cesium Iodide
CAS RN: 7789-17-5

C2202 25g 100g

CsBr

Cesium Bromide
CAS RN: 7787-69-1

C2203 25g 100g

CsCl

Cesium Chloride
CAS RN: 7647-17-8

Bismuth Halides

B5787 5g 25g

BiI_3

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

Tin Halides

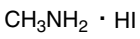
T3449 1g 5g

SnI_2

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

Organic Onium Salts

Iodide Salts

M2556 1g 5g 25g 100g

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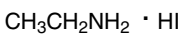
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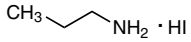
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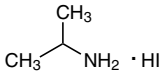
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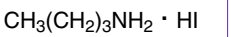
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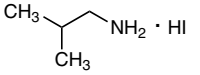
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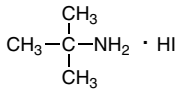
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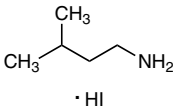
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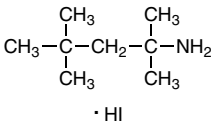
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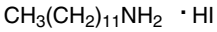
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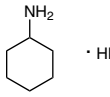
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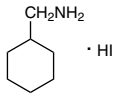
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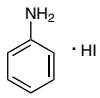
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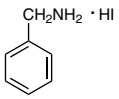
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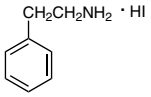
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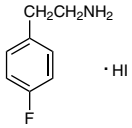
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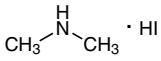
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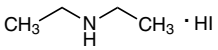
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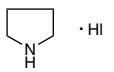
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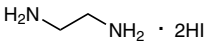
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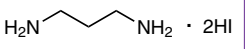
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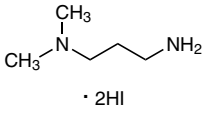
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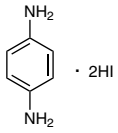
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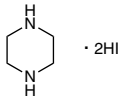
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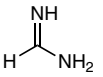
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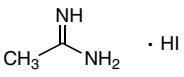
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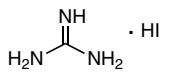
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Imidazole Hydroiodide
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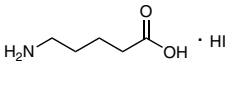
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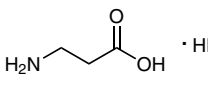
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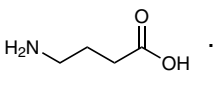
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Bromide Salts

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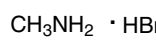
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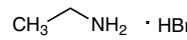
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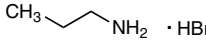
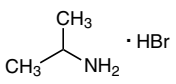
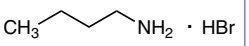

Propylamine Hydrobromide
CAS RN: 4905-83-3

I1041 1g 5g

Isopropylamine Hydrobromide
CAS RN: 29552-58-7

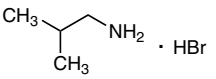
Please inquire for pricing and availability of listed products to our local sales representatives.

B5186 1g 5g



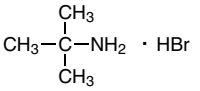
Butylamine Hydrobromide
CAS RN: 15567-09-6

I1007 1g 5g



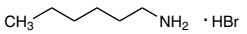
Isobutylamine Hydrobromide
CAS RN: 74098-36-5

B5187 1g 5g



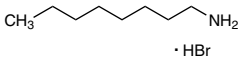
tert-Butylamine Hydrobromide
CAS RN: 60469-70-7

H1678 1g 5g



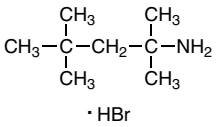
Hexylamine Hydrobromide
CAS RN: 7334-95-4

O0442 1g 5g



n-Octylamine Hydrobromide
CAS RN: 14846-47-0

T3783 1g 5g



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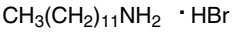
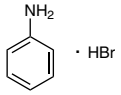
CAS RN: 1093859-61-0

D5537 1g 5g



Dodecylamine Hydrobromide
CAS RN: 26204-55-7

A2985 1g 5g



Aniline Hydrobromide
CAS RN: 542-11-0

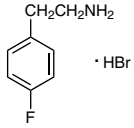
B5185 1g 5g

Benzylamine Hydrobromide
CAS RN: 37488-40-7

P2388 1g 5g

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

F1229 1g 5g

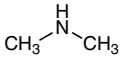


2-(4-Fluorophenyl)ethylamine Hydrobromide
CAS RN: 1807536-06-6

P2484 1g 5g

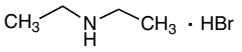
Pyrrolidine Hydrobromide
CAS RN: 55810-80-5

D5092 1g 5g



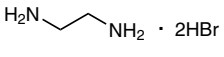
Dimethylamine Hydrobromide
CAS RN: 6912-12-5

D4667 1g 5g



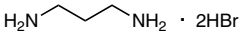
Diethylamine Hydrobromide
CAS RN: 6274-12-0

E1221 1g 5g



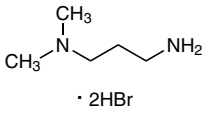
Ethylenediamine Dihydrobromide
CAS RN: 624-59-9

D5090 1g 5g



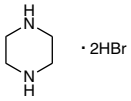
1,3-Diaminopropane Dihydrobromide
CAS RN: 18773-03-0

D5618 1g 5g



N,N-Dimethyl-1,3-propanediamine Dihydrobromide

P2490 1g 5g

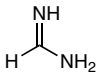


Piperazine Dihydrobromide
CAS RN: 59813-05-7

D5250 1g 5g

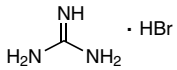
1,4-Diazabicyclo[2.2.2]-octane Dihydrobromide
CAS RN: 54581-69-0

F0973 1g 5g 25g



Formamidine Hydrobromide
CAS RN: 146958-06-7

G0449 1g 5g

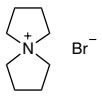


Guanidine Hydrobromide
CAS RN: 19244-98-5

I1006 1g 5g

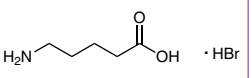
Imidazole Hydrobromide
(Low water content)
CAS RN: 101023-55-6

A3091 1g 5g 25g



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

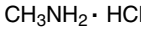
A3094 1g 5g



5-AVABr (Low water content)

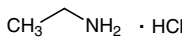
Chloride Salts

M0138 25g 500g



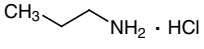
Methylamine Hydrochloride
CAS RN: 593-51-1

E0205 25g 500g



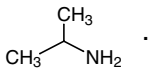
Ethylamine Hydrochloride
CAS RN: 557-66-4

P0522 25g



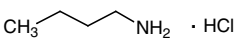
Propylamine Hydrochloride
CAS RN: 556-53-6

I0166 25g 100g 500g



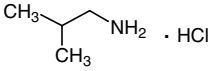
Isopropylamine Hydrochloride
CAS RN: 15572-56-2

B0710 25g 500g



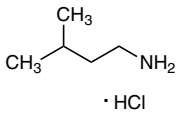
Butylamine Hydrochloride
CAS RN: 3858-78-4

I0096 25g 500g



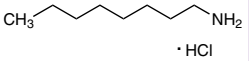
Isobutylamine Hydrochloride
CAS RN: 5041-09-8

I0083 1g 5g



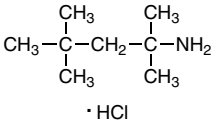
Isopentylamine Hydrochloride
CAS RN: 541-23-1

O0484 1g 5g



n-Octylamine Hydrochloride
CAS RN: 142-95-0

T3784 1g 5g

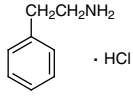


tert-Octylamine Hydrochloride
CAS RN: 58618-91-0

B0407 25g 100g 500g

Benzylamine Hydrochloride
CAS RN: 3287-99-8

P0086 25g 100g 500g

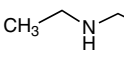


2-Phenylethylamine Hydrochloride
CAS RN: 156-28-5

P2485 1g 5g

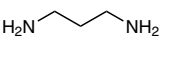
Pyrrolidine Hydrochloride
CAS RN: 25150-61-2

D0468 25g 500g



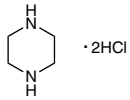
Diethylamine Hydrochloride
CAS RN: 660-68-4

D5253 1g 5g



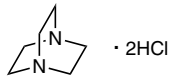
1,3-Diaminopropane Dihydrochloride (Low water content)
CAS RN: 10517-44-9

P2491 1g 5g



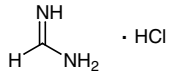
Piperazine Dihydrochloride
CAS RN: 142-64-3

D5251 1g 5g



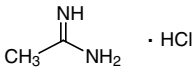
1,4-Diazabicyclo[2.2.2]-octane Dihydrochloride
CAS RN: 49563-87-3

F0103 5g 25g



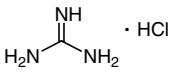
Formamidine Hydrochloride
CAS RN: 6313-33-3

A0008 25g 500g



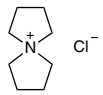
Acetamidine Hydrochloride
CAS RN: 124-42-5

G0162 25g 500g



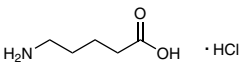
Guanidine Hydrochloride
CAS RN: 50-01-1

A3092 1g 5g



5-Azoniaspiro[4.4]nonane Chloride
CAS RN: 98997-63-8

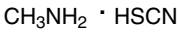
A0436 1g 5g



5-AVACl (Low water content)
CAS RN: 627-95-2

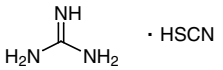
Pseudo Halide Salts

M2991 1g 5g



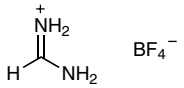
Methylamine Thiocyanate
CAS RN: 61540-63-4

G0230 25g 500g



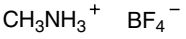
Guanidine Thiocyanate
CAS RN: 593-84-0

F1152 1g 5g



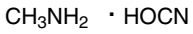
Formamidinium Tetrafluoroborate

M2990 1g 5g



Methylamine Tetrafluoroborate
CAS RN: 42539-74-2

M3134 1g 5g



Methylamine Cyanate
CAS RN: 63405-91-4

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