Highly Purified and Rapidly Soluble
Crystalline Perovskite Precursors
MAPbI$_3$-DMF and FAPbI$_3$

**Advantages**
- Highly purified (99.99%) and rapidly soluble
- Ready-to-use crystalline solid for one-solution method
- Serves high PCE with reproducibility

MAPbI$_3$-DMF [P2415] and FAPbI$_3$ [P2417] are crystalline solids with high purity of 99.99% (trace metals basis). P2415 or P2417 is rapidly soluble compared with separate use of PbI$_2$ and MAI, or PbI$_2$ and FAI, respectively. These also show good solubility in DMSO. Wakamiya et al. have reported that P2415 can realize high power conversion efficiency (PCE) and reproducibility at a perovskite solar cell (PSC) device, and the low volatility of the pure DMSO solvent can extend the allowable time for antisolvent addition, and then can largely relax the time precision required for the antisolvent addition step. On the other hand, they say that P2417 can be used with other cations Cs, MA, etc. forming mix-cation perovskites, and the PSC device can realize high efficiency and stability by an ambient air aging method.

**Rapid Dissolution**

Left: MAPbI$_3$-DMF [P2415]
Right: MAI + PbI$_2$ (1:1)

1.5 mmol of ‘MA/Pb’ were added to 1 mL of DMSO and stirred for 3 min at room temp.

Left: FAPbI$_3$ [P2417]
Right: FAI + PbI$_2$ (1:1)

1.2 mmol of ‘FA/Pb’ were added to 1 mL of DMSO and stirred for 10 min at room temp.

**PSC Device Performances**

Table 1. (from Reference 1)
P2415 serves high PCE with reproducibility compared with MAI and PbI$_2$. (PCE = 19.8% (0.1 cm$^2$ cell), 14.2% (22 cm$^2$ cell))

<table>
<thead>
<tr>
<th>MAPbI$_3$ source$^1$</th>
<th>$J_{SC}$ (mA/cm$^2$)</th>
<th>$V_{OC}$ (V)</th>
<th>FF</th>
<th>PCE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAPbI$_3$ DMF [P2415]</td>
<td>22.7</td>
<td>1.15</td>
<td>0.76</td>
<td>19.8</td>
</tr>
<tr>
<td>MAI + PbI$_2$ (1:1)</td>
<td>21.8</td>
<td>1.15</td>
<td>0.70</td>
<td>17.6</td>
</tr>
</tbody>
</table>

$^1$ MAPbI$_3$ based Perovskite Solar Cell

Table 2. (from Reference 2)
P2417 is excellent precursor of FA containing perovskite layer. (Stable to long term storage as compared with FAI and PbI$_2$)

<table>
<thead>
<tr>
<th>FAPbI$_3$ source$^2$</th>
<th>$J_{SC}$ (mA/cm$^2$)</th>
<th>$V_{OC}$ (V)</th>
<th>FF</th>
<th>PCE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAPbI$_3$ [P2417]</td>
<td>23.7</td>
<td>1.11</td>
<td>0.78</td>
<td>20.6</td>
</tr>
<tr>
<td>FAI + PbI$_2$ (1:1)</td>
<td>23.0</td>
<td>1.11</td>
<td>0.75</td>
<td>19.4</td>
</tr>
</tbody>
</table>

$^2$ Optimized device by ambient air aging method (see, Reference 2)

**References**
2) A. Wakamiya et al., Iodine-rich mixed composition perovskites optimised for tin(IV) oxide transport layers: the influence of halide ion ratio, annealing time, and ambient air aging on solar cell performance. J. Mater. Chem. A 2019, 7, 7647.

**MAPbI$_3$-DMF** (99.99%, trace metal basis) [for Perovskite precursor] 1g / 5g / 25g [P2415]
**FAPbI$_3$** (99.99%, trace metal basis) [for Perovskite precursor] 1g / 5g / 25g [P2417]

These products are commercialized by collaboration with Prof. Atsushi Wakamiya at Institute for Chemical Research, Kyoto University.