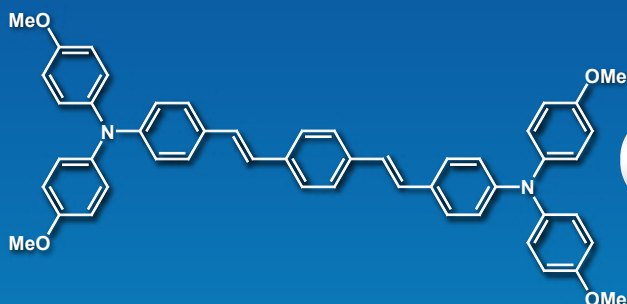


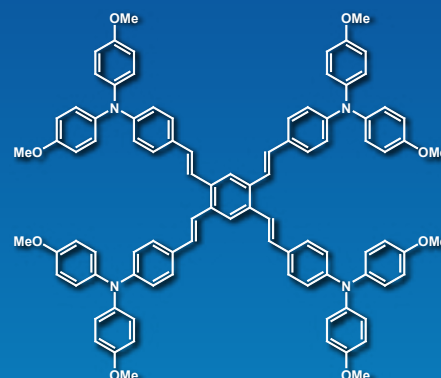
New

# For Stable Perovskite Solar Cells, Hole Transport Materials: TOP-HTM



**TOP-HTM-α1**  
1g / 5g / 25g  
[B5672]

TCI Original & Practical Hole Transport Materials



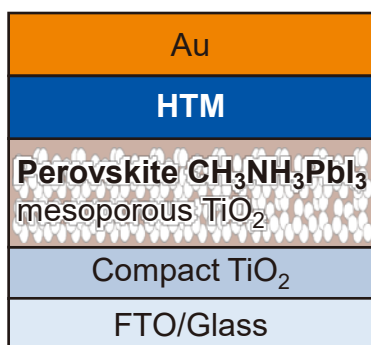
**TOP-HTM-α2**  
1g / 5g / 25g  
[T3722]

## Advantages

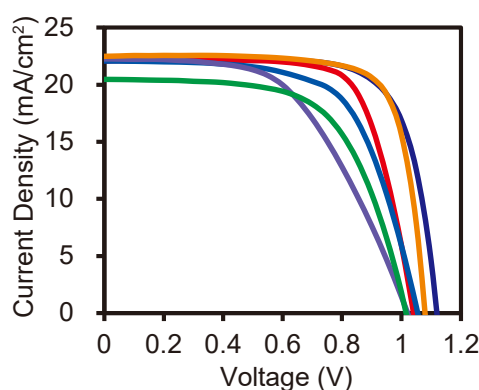
- Realize a high PCE both with or without additives
- Realize a highly stable perovskite solar cell with low cost

## Applications

### Device Structure

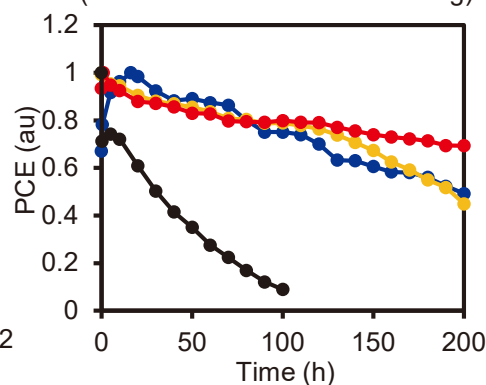


### Device Performances



### Device Stabilities

(Maximum Power Point Tracking)



### Power Conversion Efficiency (PCE)

	TOP-HTM-α1	TOP-HTM-α2	Spiro-OMeTAD
with Additives	13.1%	18.6%	18.4%
without Additives	15.0%	16.6%	12.1%

\*These data are from the following reference.

H. Nishimura, I. Okada, T. Tanabe, T. Nakamura, R. Murdey, A. Wakamiya, *ACS Appl. Mater. Interfaces* **2020**, *12*, 32994.  
DOI: <http://doi.org/10.1021/acsami.0c06055>

# For Stable Perovskite Solar Cells, Hole Transport Materials: TOP-HTM

## Device Fabrication Process

### Preparation of HTM solution

#### 1. With additives

HTMs are dissolved in chlorobenzene at concentration of 40 mg/mL with additives.

##### • TOP-HTM- $\alpha$ 1

The amount of LiTFSI and TBP are 4.8 mg and 15.2  $\mu$ L for 1 mL of HTM solution. HTM solution is heated at 70 °C.

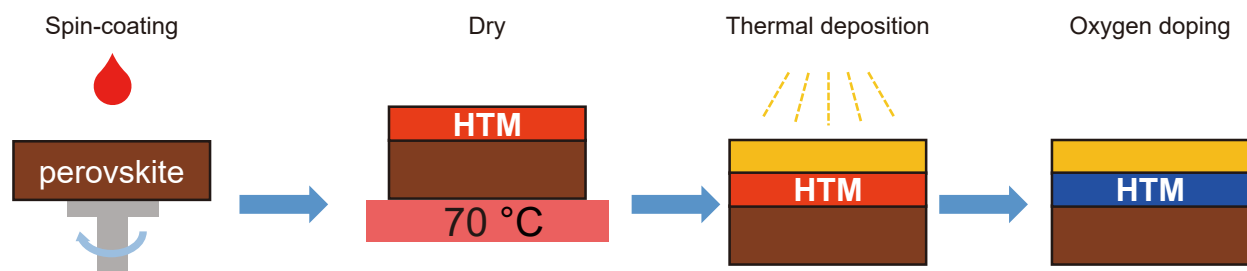
##### • TOP-HTM- $\alpha$ 2

The amount of LiTFSI and TBP are 6.0 mg and 19.0  $\mu$ L for 1 mL of HTM solution. HTM solution is heated at 85 °C.

#### 2. Without additives

HTMs are dissolved in 1,1,2,2-tetrachloroethane at concentration of 40 mg/mL. HTM solution is heated at 70 °C.

### Fabrication of devices



- 1) In a glove box filled with  $N_2$  gas, hole transport layers are deposited on the perovskite layer by spin-coating (slope 5 s, 4000 rpm 30 s, slope 5 s).
- 2) The resulting film is dried on a hot plate at 70 °C for 30 min.
- 3) A metal electrode (Au, etc.) is thermally deposited on the hole transport layer.
- 4) The solar cell devices are stored in air with ~20% relative humidity to promote oxygen doping.

For more details, see the following reference.

H. Nishimura, I. Okada, T. Tanabe, T. Nakamura, R. Murdey, A. Wakamiya, *ACS Appl. Mater. Interfaces* **2020**, 12, 32994.  
DOI: <http://doi.org/10.1021/acsami.0c06055>

### Related Products

**Lithium Bis(trifluoromethanesulfonyl)imide (= LiTFSI)**  
**4-tert-Butylpyridine (= TBP)**

25g / 250g [B2542]

5g / 25g [B0388]

For further information please refer to our website at [www.TCIchemicals.com](http://www.TCIchemicals.com).

▶▶▶ solar cell



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