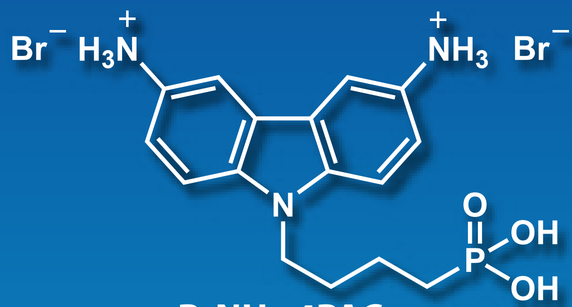
New

MATERIALS

TCI

SAM-Forming Agent for Efficient NBG-Type Perovskite Solar Cells: $BrNH_3$-4PACz



$BrNH_3$-4PACz
500mg
[B7049]

Perovskite solar cells (PSCs) have attracted much attention as a potential next-generation solar cell. High-efficiency tandem PSCs can be fabricated by combining a wide-bandgap (WBG) Pb-PSC (top cell) with a narrow-bandgap (NBG) Pb/Sn-PSC (bottom cell). Based on this research background, in addition to conventional WBG-type PSCs, NBG-type PSCs have also been actively studied in recent years. PEDOT/PSS, a HTL material primarily used in p-i-n PSCs, has a drawback in that PSS oxidizes Sn^{2+}. Therefore, in the fabrication of PSCs containing Sn, such as NBG-type PSCs, it is considered desirable to replace PEDOT/PSS with a self-assembled monolayer (SAM)-forming agent.[1)]

Advantages

- $BrNH_3$-4PACz is suitable as a SAM-forming agent for Pb/Sn mixed NBG-type PSCs, and can achieve the highest level of efficiency among NBG-type PSCs.
- The phosphonic acid group treats the ITO surface, and the ammonium salt moiety (-NH_3Br) bonded to the carbazole ring treats the perovskite layer surface (dual functions of passivation).
- SAMs based on $BrNH_3$-4PACz have a smaller water contact angle and are relatively hydrophilic compared to SAMs based on other PACz series, improving wettability during perovskite layer formation.

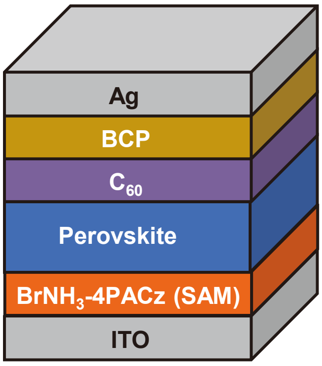
Performance of NBG-Type Perovskite Solar Cells using SAM-Forming Agent

SAM	JSC (mA/cm^2)	V_{OC} (V)	FF (%)	PCE (%)	Solar cell architecture	Ref.
$BrNH_3$-4PACz	32.2	0.88	81.9	23.0	ITO/$BrNH_3$-4PACz/ $Cs_{0.05}FA_{0.7}MA_{0.25}Pb_{0.5}Sn_{0.5}I_3/C_{60}$/BCP/Ag	1)
2PACz	30.6	0.82	65.4	16.5	ITO/2PACz/ $Cs_{0.05}FA_{0.7}MA_{0.25}Pb_{0.5}Sn_{0.5}I_3/C_{60}$/BCP/Ag	1)
MeO-2PACz	25.8	0.80	55.2	11.3	ITO/MeO-2PACz/ $Cs_{0.05}FA_{0.7}MA_{0.25}Pb_{0.5}Sn_{0.5}I_3/C_{60}$/BCP/Ag	1)
Br-2PACz	32.0	0.82	75.1	19.4	ITO/(Br-2PACz + 4CzNH$_3$I)/ $Cs_{0.25}FA_{0.75}Pb_{0.5}Sn_{0.5}I_3/C_{60}$/BCP/Ag	2)

References 1) S. Zhumagali, S. De Wolf, *et al.*, *Adv. Energy Mater.* **2025**, *15*, 2404617. https://doi.org/10.1002/aenm.202404617
2) M. Pitaro, M. A. Loi, *et al.*, *Adv. Funct. Mater.* **2023**, *34*, 2306571. https://doi.org/10.1002/adfm.202306571

SAM-Forming Agent for Efficient NBG-Type Perovskite Solar Cells: $BrNH_3$-4PACz

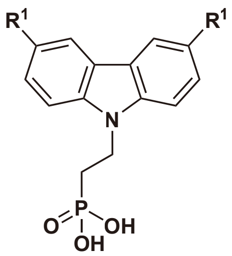
Coating Method of $BrNH_3$-4PACz



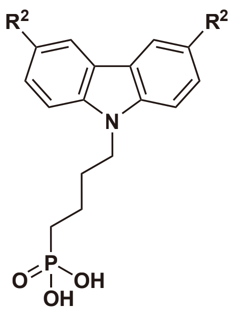
1. Dissolve $BrNH_3$-4PACz [B7049] in methanol/ethanol mixture (1:1 v/v, 0.2 mg/mL).
2. Spin-coat the solution onto ITO glass (3,000 rpm for 35 seconds).
3. Anneal at 100°C for 10 minutes.
4. Wash the resulting SAM with ethanol.

For more details, please see the literature below:
S. Zhumagali, M. Marcinskas, R. Azmi, V. Getautis, T. Malinauskas, E. Aydin, E. H. Sargent, S. De Wolf, *et al.*, *Adv. Energy Mater.* **2025**, *15*, 2404617.
https://doi.org/10.1002/aenm.202404617

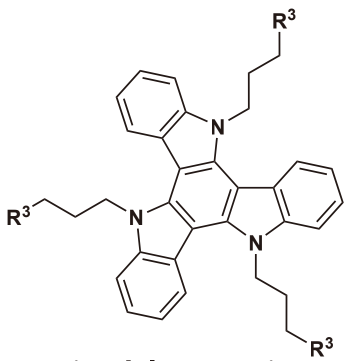
Related Products (SAM-Forming Agents)



2PACz series



4PACz series



Tripodal SAM series

R^1 = H	2PACz	500mg	[C3663]
R^1 = MeO	MeO-2PACz	500mg	[D5798]
R^1 = Me	Me-2PACz	500mg	[M3477]
R^1 = Br	Br-2PACz	500mg	[B6391]
R^1 = Cl	Cl-2PACz	500mg	[C3914]
R^1 = F	F-2PACz	500mg	[F1374]
R^1 = I	I-2PACz	500mg	[I1255]
R^2 = H	4PACz	500mg	[P2995]
R^2 = MeO	MeO-4PACz	500mg	[M3549]
R^2 = Me	Me-4PACz	500mg	[M3359]
R^2 = Br	Br-4PACz	500mg	[B6445]
R^3 = $PO(OH)_2$	3PATAT-C3	500mg	[P3172]
R^3 = COOH	3CATAT-C3	500mg	[C4192]

For further information please refer to our website at www.TCIchemicals.com.

TCI SAM

or

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