Electronic Supplementary Material (ESI) for RSC Advances.

LARP-assisted synthesis of $CsBi_3I_{10}$ perovskite for efficient lead-free solar cells

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Supporting information

Figure S1: XRD pattern of $CsBi_3I_{10}$ film

Figure S2: (a) Absorption spectra of $CsBi_3I_{10}$ film recorded before (at room temperature) and after annealing (100 °C), (b) Photograph of $CsBi_3I_{10}$ film deposited over NiO layer before and, (c) after annealing.

Figure S3: Energy Dispersive X-Ray (EDX) analysis of (a) $Cs_3Bi_2I_9$ (b) $CsBi_3I_{10}$ (after annealing at 100 °C)

Table S1: The comparison table of the performance of $CsBi_3I_{10}$ perovskite-based solar cells

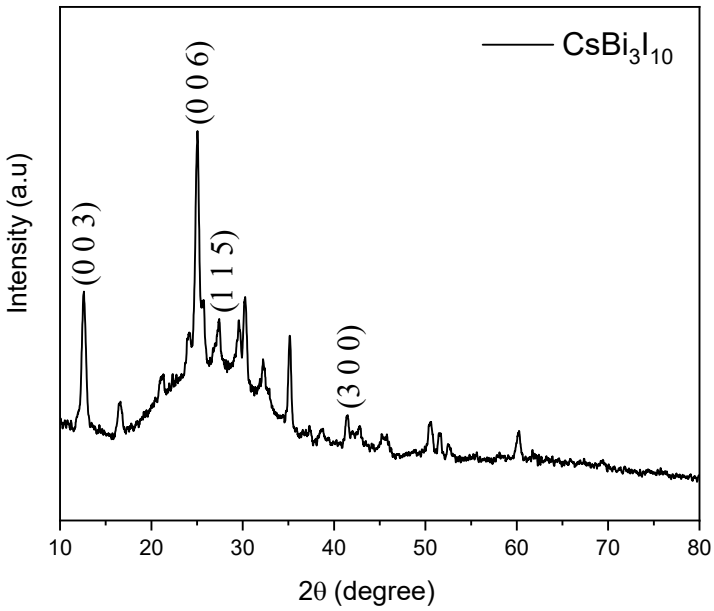

Figure S1 XRD pattern of $CsBi_3I_{10}$ film

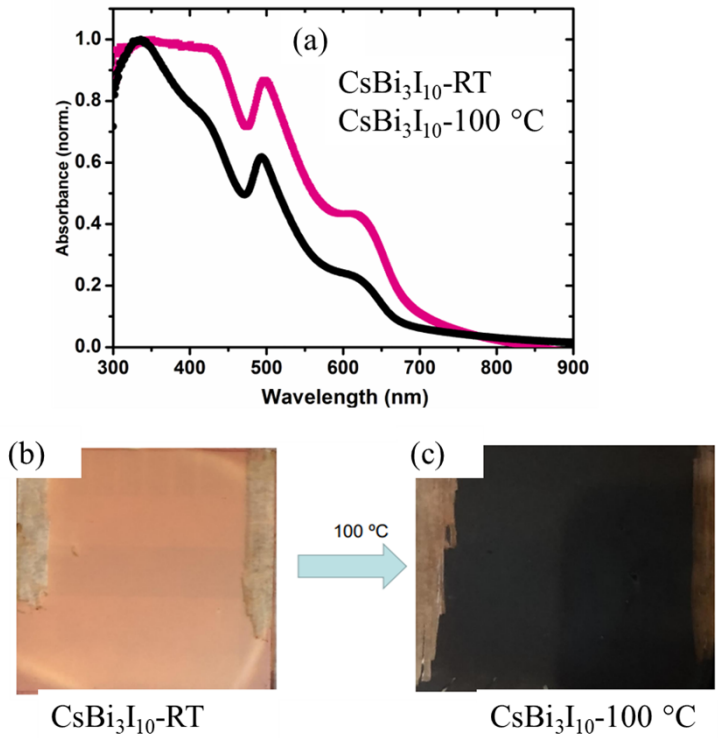

Figure S2 (a) Absorption spectra of $CsBi_3I_{10}$ film recorded before (at room temperature) and after annealing (100 °C), (b) Photograph of $CsBi_3I_{10}$ film deposited over NiO layer before and, (d) after annealing.

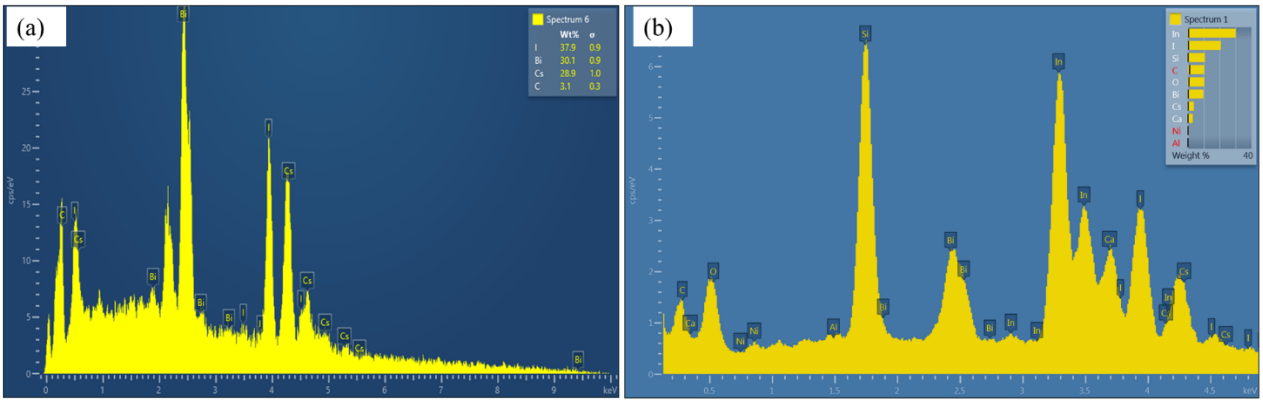

Figure S3 Energy Dispersive X-Ray (EDX) analysis of (a) $Cs_3Bi_2I_9$ (b) $CsBi_3I_{10}$ (after annealing at 100 °C)

Table S1 The comparison table of the performance of $CsBi_3I_{10}$ perovskite-based solar cells reported in the literature.

Perovskite Material	**Band gap (eV)**	**Device Geometry**	**V_{oc} (V)**	**J_{sc} (mA)**	**PCE (%)**	**Ref**
$CsBi_3I_{10}$	NA	ITO/PEDOT/$CsBi_3I_{10}$/PCBM/BCP/Ag	0.65	4.10	1.18	1
$CsBi_3I_{10}$	1.8	ITO/PTAA/PEDOT:PSS/$Cs_3Bi_2I_9$/PCBM/Ag	0.74	3.42	1.26	2
$CsBi_3I_{10}$ $MABi_3I_{10}$ $FABi_3I_{10}$	1.76 1.78 1.81	FTO/TiO_2/ZrO_2/ABi_3I_{10}/Carbon	0.46 0.47 0.45	4.75 3.40 3.88	1.51 0.67 0.87	3
$Cs_3Bi_2I_9$ $CsBi_3I_{10}$	2.03 1.77	Glass/FTO/TiO_2/$CsBi_3I_{10}$/P3HT/Ag	0.26 0.31	0.18 3.40	0.02 0.40	4
$CsBi_3I_{10}$	NA	FTO/TiO_2/$CsBi_3I_{10}$/Spiro-OMeTAD/Ag	0.43	1.73	0.32	5
$CsBi_3I_{10}$	1.78	ITO/PEDOT:PSS/CBI/BCP/C60/BCP/Ag	0.67	2.46	0.80	6
$CsBi_3I_{10}$	1.75	ITO/PEDOT:PSS/$CsBi_3I_{10}$/PCBM/BCP/Au	0.70	2.66	0.63	7
$CsBi_3I_{10}$	1.75	FTO/NiO_x/$CsBi_3I_{10}$/PCBM/BCP/Au FTO/PEDOT:PSS/$CsBi_3I_{10}$/PCBM/BCP/Au	0.73 0.62	2.89 2.09	0.72 0.37	8
$CsBi_3I_{10}$	1.78	glass/FTO/TiO_2/$CsBi_3I_{10}$/Spiro-OMeTAD/Ag	0.55	4.45	1.03	9
$CsBi_3I_{10}$	1.79	glass/FTO/c-TiO_2/m-TiO_2/$CsBi_3I_{10}$/Spiro-OMeTAD/Ag	0.38	4.86	0.84	10
$Cs_3Bi_2I_9$ **$CsBi_3I_{10}$**	**2.05** **1.72**	**ITO/NiO/Perovskite/$PC_{61}BM$/BCP/Ag**	**0.62** **0.79**	**2.4** **4.2**	**0.7** **2.3**	**This work**

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