Supporting Information

Enhanced Nanogenerator of Embedding Lead-Free Double Perovskite $Cs_2AgBiBr_6$ in Polymer Matrix for Hybrid Energy Harvesting

Mengrou Wang[1], Xin Wang[1], Yubing Xu[1], Shunjie Chai[1], Zhiwei Zhao[1], Qing Li[1], Jun Wu[1], Jing Chen[1], Zhuoya Zhu[1], Byung Seong Bae[2], Razika Tala-Ighil[3], Jianming Zhou[4], Ying Zhu[5], Wei Lei[1*]

[1]School of Electronic Science and Engineering, Joint International Research Laboratory of Information Display and Visualization, Southeast University, Nanjing 210000, China

[2]Department of Electronics &Display Engineering Hoseo University, Hoseo Ro 79, Asan city, Chungnam 31499, Republic of Korea

[3]Department of Physics, URMPE Unit, UMBB University, 35000 Boumerdes, Algeria

[4]E-xray Electronic Co. Ltd., Suzhou 215131, China

[5]E-spectrum Optoelectronic Co. Ltd., Suzhou 215111, China

[*]Corresponding author. E-mail address: lw@seu.edu.cn (W. Lei)

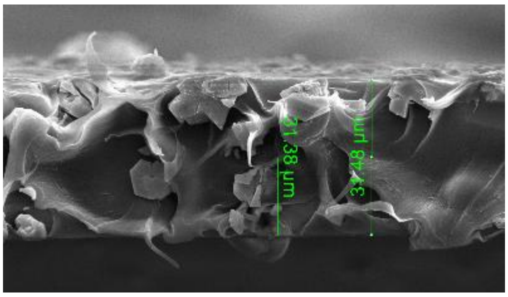

Fig.S1 Average thickness of the prepared 20 wt% CABB - PVDF composite film

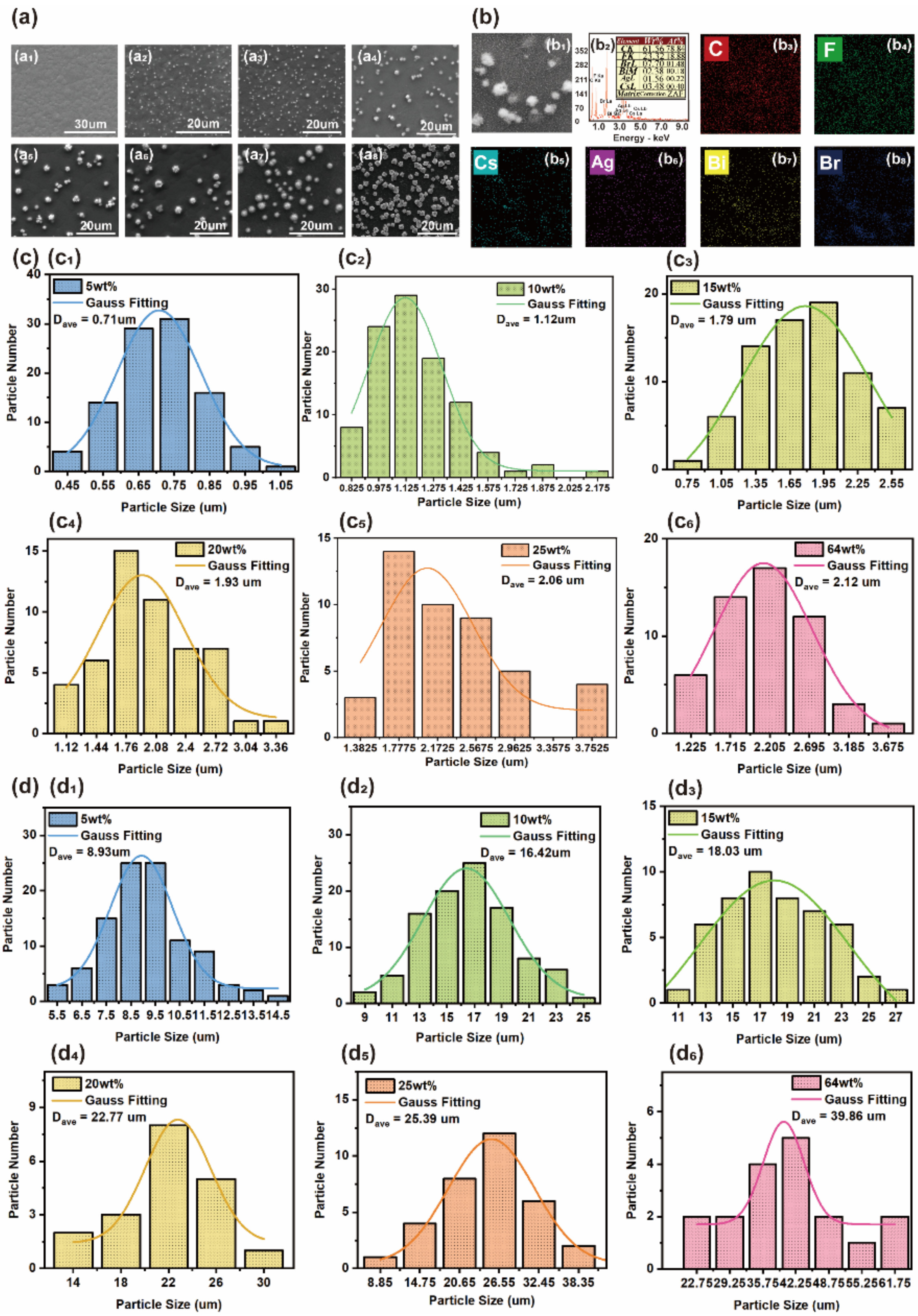

Fig.S2 Surface properties of composite films with various CABB concentration. **(a)** Surface morphology of CABB - PVDF composite films with different CABB mass fraction obtained by spin-coating only. Surface morphology of **(a_1) ~ (a_7)** 0 wt% ~ 64% wt% CABB - PVDF composite films, and **(a_8)** CABB film. **(b)** **(b_2)** SEM-energy dispersive X-ray spectroscopy (EDS) spectrum and **(b_3)** ~ **(b_8)** Elemental (C, F, Cs, Ag, Bi and Br) mapping images of 20 wt% CABB - PVDF composite film obtained by spin-coating method. Gaussian fitting of **(c)** spin-coating only and **(d)** spin-coating and extra drop casting method with different CABB concentration. **(c_1)** ~ **(c_6)** and **(d_1)** ~ **(d_6)** 0 wt% ~ 64% wt% CABB - PVDF composite films.

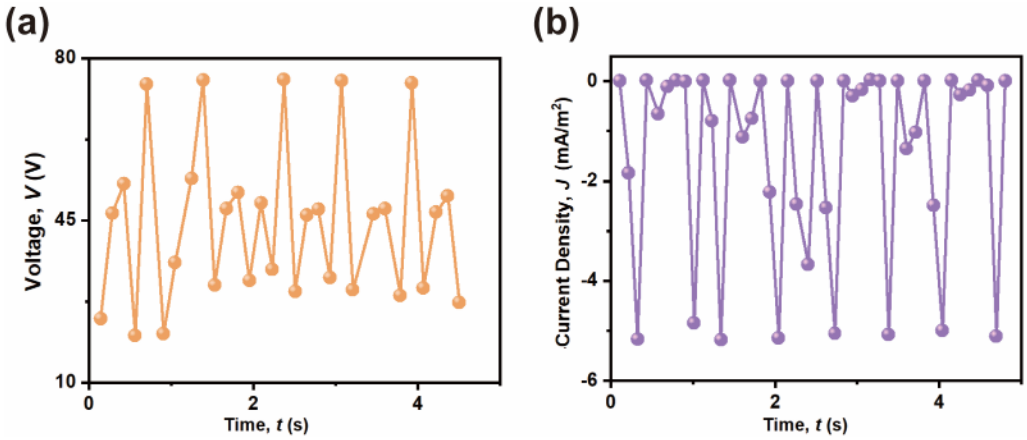

Fig.S3 **(a)** Load voltage, and **(b)** load current density of PET/ITO/20wt% CABB @ PVDF // PET/Al HENG with 500MΩ load and 1.2cm * 1.2cm size at 8Hz mechanical frequency.

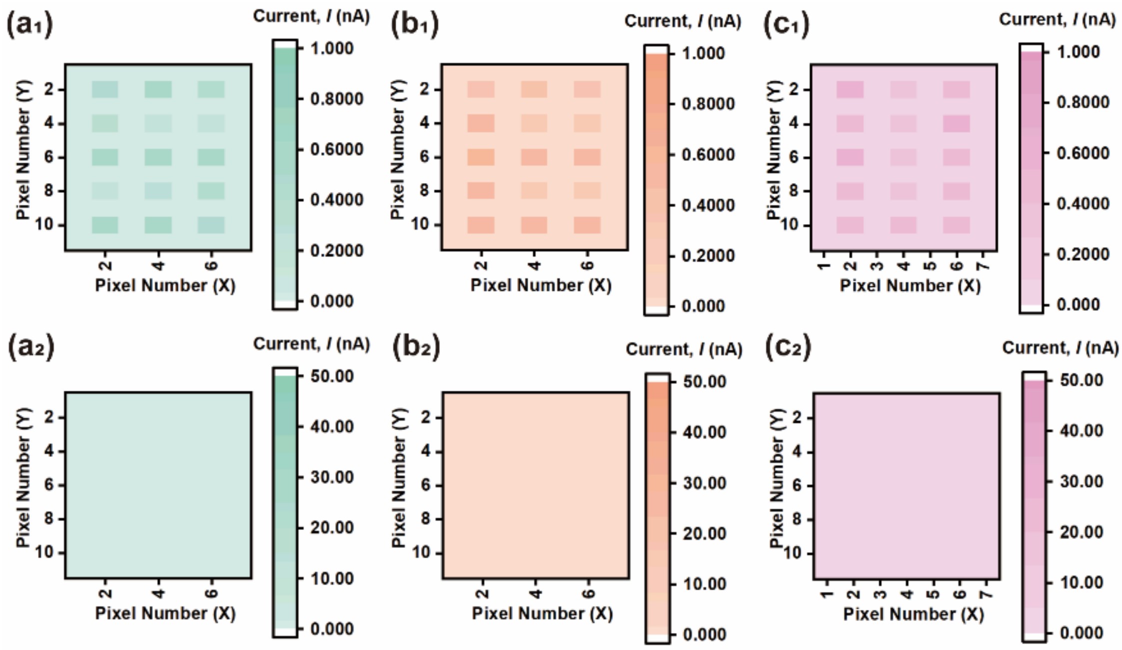

Fig.S4 Actual current distribution when force impacted at relevant PVDF pixel. **(a_1) ~ (c_1)** At 0 ~ 1nA scale. **(a_2) ~ (c_2)** At 0 ~ 50nA scale.

Table S1 Output performances comparation of various perovskite based or PVDF composite based TENGs.

Perovskite based or PVDF composite based nanogenerators		Test condition (Film thickness, Pressure, Mechanical Frequency)	Open-circuit Voltage	Short-circuit current / current density	Output power density	Ref.
Perovskite based nanogenerator	$MAPbI_3$	-	8 V	-	-	1
	$CsPbBr_{2.6}I_{0.4}$	-/0.5 Hz	192 V	16.7 μA	0.12 mW/cm^2	2
	$Cs_{0.175}FA_{0.750}MA_{0.075}Pb(I_{0.880}Br_{0.120})_3$	-	0.8 V	11 $\mu A/cm^2$	18 $\mu W/cm^2$	3
	PDMS // 20 wt% $CsPbBr_3$-KBr	5Hz	43.4 V	900 nA	-	4
	25 wt% $MAPbI_3$ - PVDF	300 kPa/5 Hz	44.7 V	4.34 $\mu A/cm^2$	59 $\mu W/cm^2$	5
PVDF composite based nanogenerator	$MAPbI_3$ - PVDF	~ 97.7 µm (drop-casted), 0.5 MPa/50 N	45.6 V	4.7 $\mu A/cm^2$	-	6
	$CsPbBr_3$ - PVDF	1.7 N	33 V	0.3$\mu A/cm^2$	2.2 $\mu W/cm^2$	7
	MoS_2 - PVDF	RH of 30%, 28°C, 10	120 V	9.4 μA	6.54	8

		N, 3Hz			μW/cm^2	
	PTFE // western blot (WB) - PVDF	-	120 V	217nA	0.5 μW/cm^2	9
	PTFE // 15 wt% ZnO - PVDF	-	119 V	1.6 μA	10.6 μW/cm^2	10
	PET // 20 wt% CABB - PVDF composite Film	70 μm, RH of 36%, 15 °C, 8 Hz	110.1 V	0.702 μA/cm^2	39 μW/cm^2	This work

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