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Supporting Information

Tribodiffusion-driven triboelectric nanogenerators based on MoS_2

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Table S1. Physical properties of previously reported TENGs based on Schottky diode or p-n junction and conventional TENGs based on MoS_2.

Reference	Structure & materials	Working mode	I_{SC} (J_{SC})	V_O (V)	Power density	Pressure (kPa)	Working mechanism
This work	ITO/PDMS/P(VDF-TrFE)/Ag NPs/MoS_2/ PPy+Pt NPs/PET	Contact-separation	120 μA (120 μA/cm^2)	200	14.4 mW/cm^2	5	Diffusion
28	n-type Si/p-type Si	Contact-separation	2 nA (0.5 nA/cm^2)	0.5	2 pW/cm^2	-	Diffusion
29	Ag/Graphene/Si/Au	Sliding	4 μA (4 mA/cm^2)	0.6	0.53 mW/cm^2	50	Tribovoltaic
30	Pt AFM tip/MoS_2/Ag	Sliding	1 nA (100 A/cm^2)	-	-	-	Tribovoltaic
31	Steel/n-type Si/electrode	Sliding	20 μA	0.02	-	50	Tribovoltaic
32	n-type AFM tip/Si	Sliding	65 pA	-	-	-	Tribovoltaic
33	electrode/n-type GaAs/p-type Si/electrode	Sliding	2.5 μA (11.2 mA/cm^2)	5.1	13 mW/cm^2	6000	Tribovoltaic
34	Au/n-type Si/p-type Si/Au	Sliding	80nA	0.3	-	50	Tribovoltaic
35	Al/PPy/Au	Contact-separation	300 μA (220 μA/cm^2)	0..7	0.02 mW/cm^2	~100	Schottky barrier modulation
36	Al/PPy, GO/Au	Contact-separation	200 μA (130 μA/cm^2)	0.73	0.02 mW/cm^2	~50	Schottky barrier modulation
37	Au/PPy/SnO_2/Al	Contact-separation	4 μA (62 μA/cm^2)	0.25	0.02 mW/cm^2	~50	Effective barrier modulation
38	Al/PANI/Au	Tensile stress	40 μA (34 μA/cm^2)	0.9	-	~50	Schottky barrier modulation
22	Cu/Nylon/MoS_2/Cu	Contact-separation	0.82 μA (1.04 μA/cm^2)	7.5	7.8 μW/cm^2	40	Triboelectrification
24	Al/PI-MoS_2 composites/Al	Contact-separation	18 μA/cm^2	400	2.57 mW/cm^2	-	Triboelectrification
25	Al/Graphite/paper/MoS_2/Al	Contact-separation	0.15 μA (0.025 μA/cm^2)	10	0.255 μW/cm^2	1	Triboelectrification

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Table S2. Comparison with previously reported TENGs.

Reference	Area (cm^2)	Materials	Transferred charge (nC/cm^2)	Power density (mW/cm^2)	Flexibility
This work	1	MoS_2, Ag NPs, P(VDF-TrFE) / PPy, Pt NPs	47	14.4	O
9	25	CP/LTV	21	2.21	O
10	18	PDMS/PMMA-TiO_2	15	3.5	X
11	30	Nylon/Silicone rubber	10	1.12	O
12	6.25	PVA, PEI/Skin	1.8	0.28	O
13	2	CNF, PEI/PVDF	20	1.3	O
14	4	PDMS/PA6	28	12	X
61	4	PI/ Au NPs, Ag NWs, PDMS	-	0.71	X

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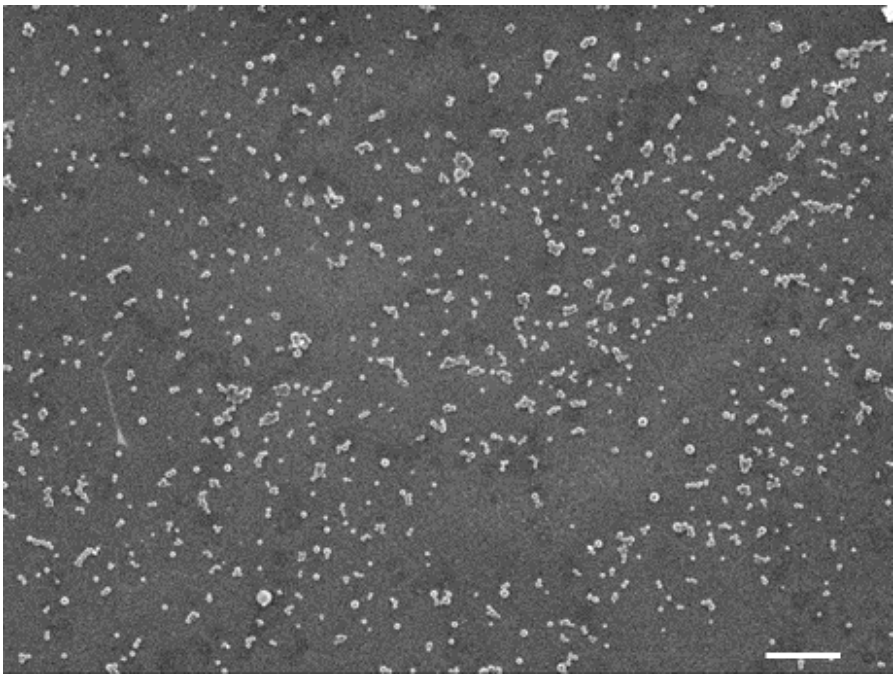

Fig. S1. SEM image of Ag NPs on MoS_2. The scale bar indicates 1μm.

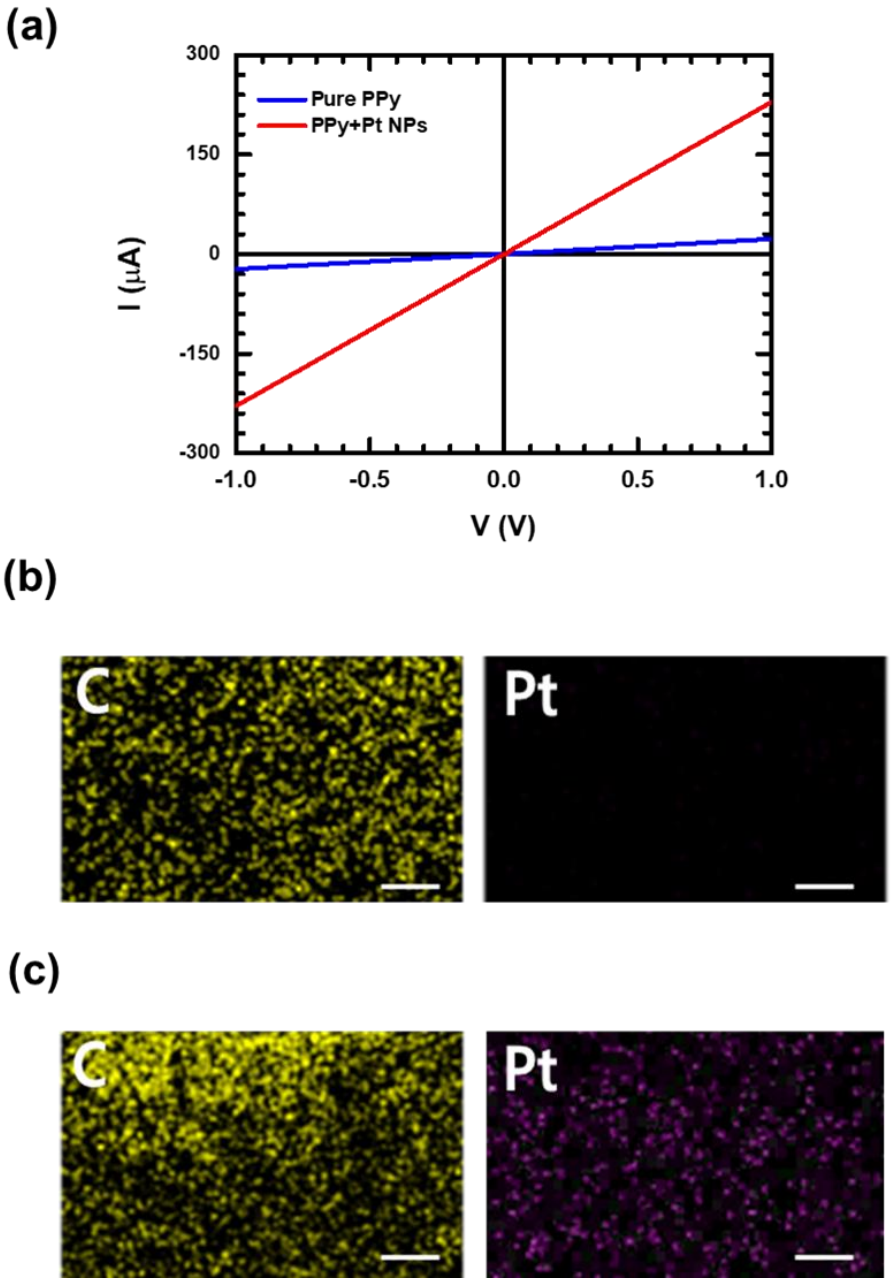

Fig. S2. (a) *I-V* curves measured for pristine PPy (blue) and PPy mixed with Pt NPs (red). Elemental mapping images of C (left) and Pt (right) measured for (b) pristine PPy and (c) PPy mixed with Pt NPs. Scale bar indicates 100 nm.

Fig. S3. Photographs of the fabricated MoS_2-based TENG Scale bar is 5 mm.

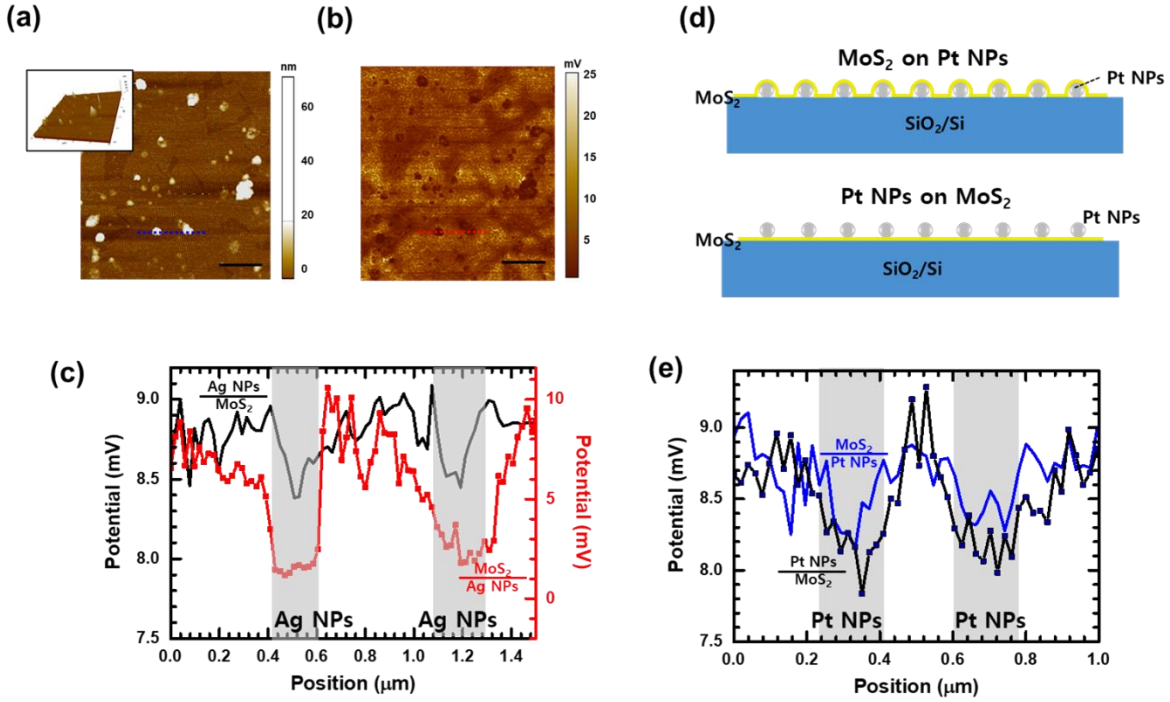

Fig. S4. (a) AFM and (b) EFM images acquired from MoS_2 with Ag NPs underneath. (c) Line profile of the EFM signal measured for MoS_2 with Ag NPs underneath (red) and Ag NPs on MoS_2 (black). The shaded regions indicate the position of Ag NPs. (d) Schematics of MoS_2 with Pt NPs underneath (upper) and Pt NPs on MoS_2 (lower). (e) Line profile of the EFM signal measured for MoS_2 with Pt NPs underneath (blue) and Pt NPs on MoS_2 (black). The shade regions indicate the position of Pt NPs.

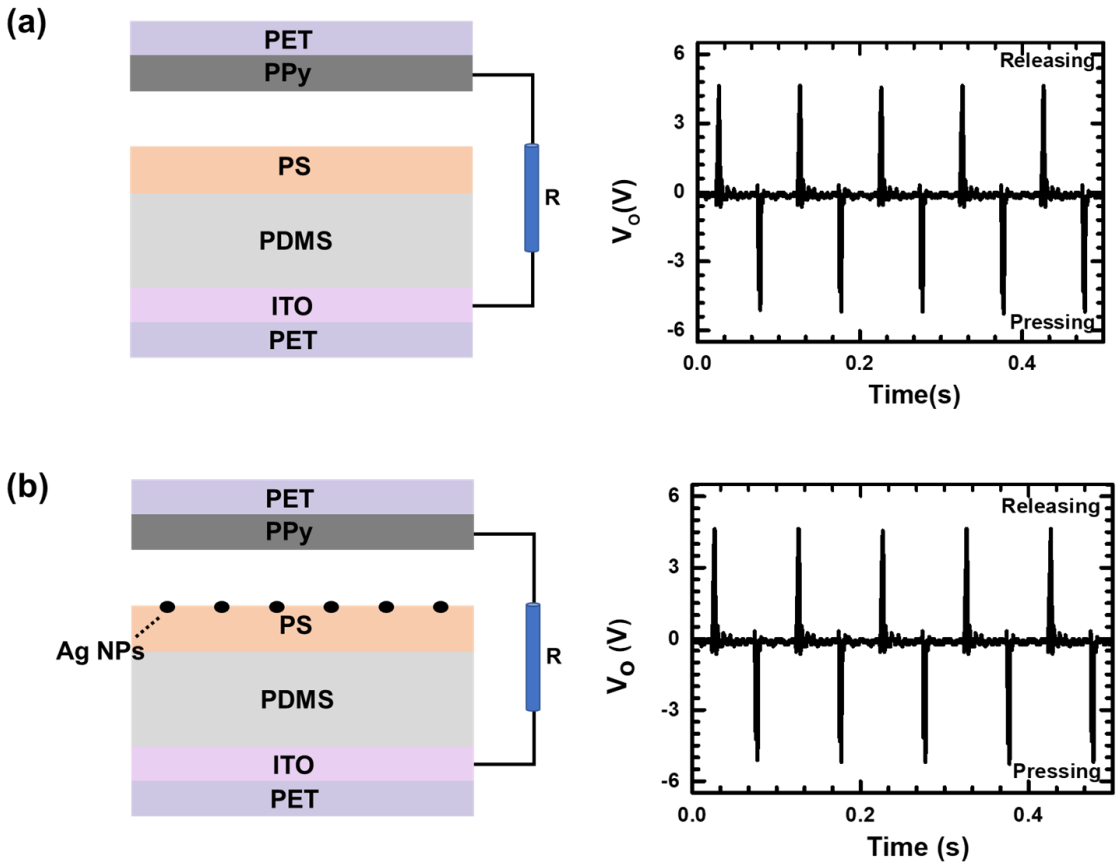

Fig. S5. Output voltage measured for (a) TENG-MS without MoS_2 and (b) TENG -MS-Ag without MoS_2 with an external load resistor of 10 MΩ at a vertical pressure of ~5 kPa and 10 Hz. Similar behaviors were observed regardless of the presence of Ag NPs.

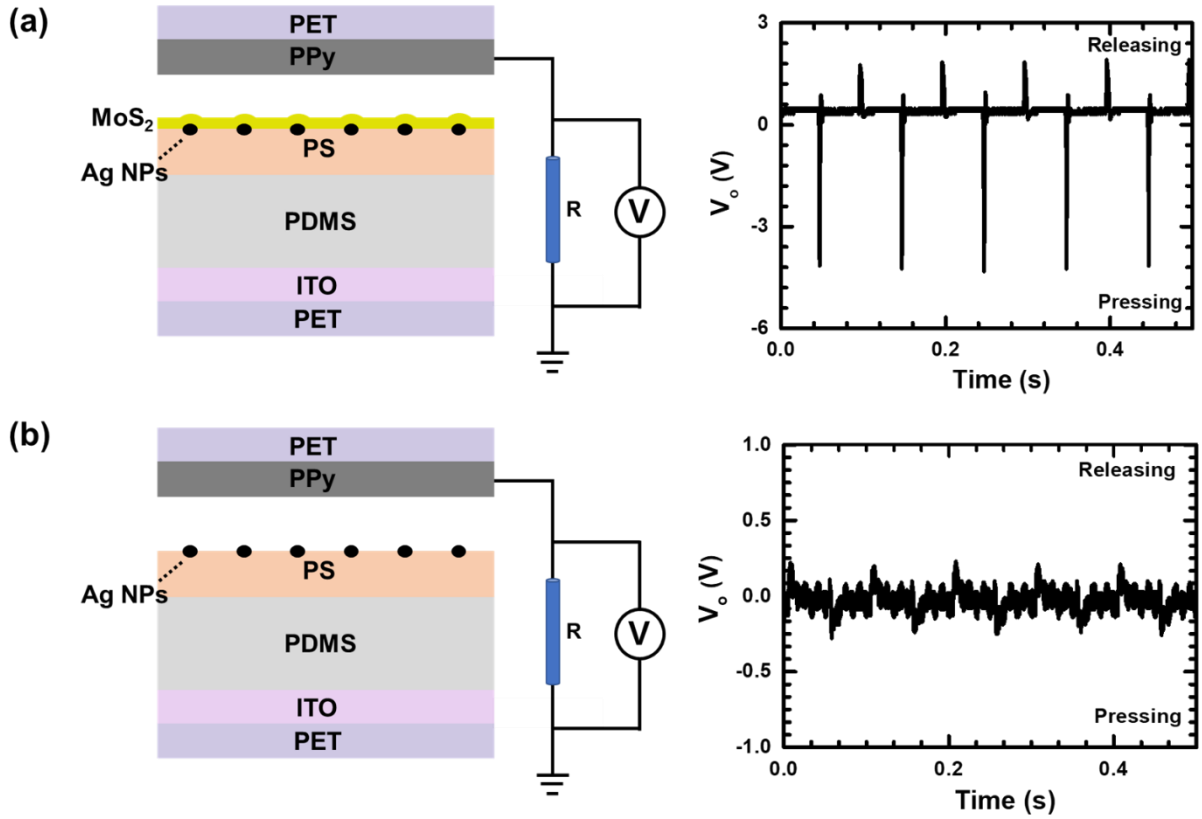

Fig. S6. Output voltage measured for (a) TENG-MS and (b) TENG without MoS_2 with the PPy connected to the ground via external load resistor of 10 MΩ at a vertical pressure of ~5 kPa and 10 Hz. Similar behaviors were observed regardless of the presence of Ag NPs.

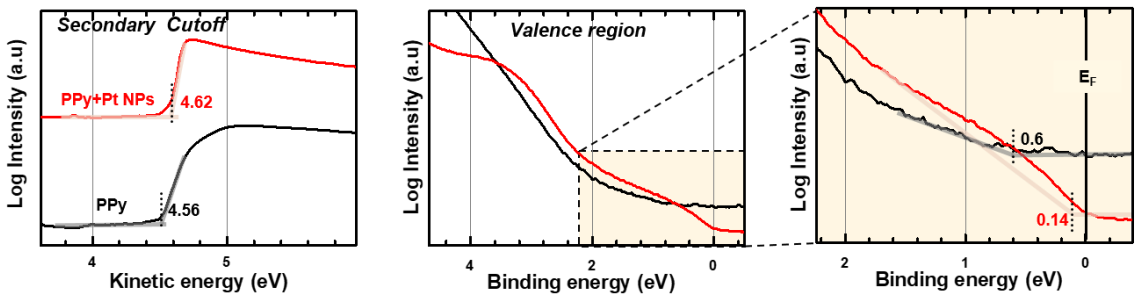

Fig. S7. UPS spectra measured for pristine PPy (black) and PPy mixed with Pt NPs (red). E_F indicates the Fermi energy level.