

## Electronic Supplementary Information

# Electrostatically self-assembled fluorinated molecule as a surface modification layer for high-performance and stable triboelectric nanogenerator

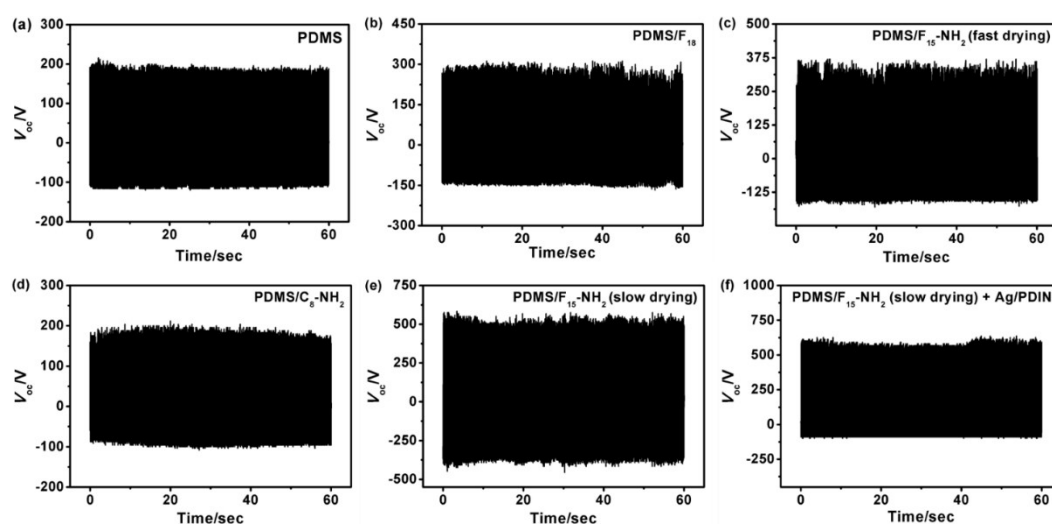
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**Table S1.** Comparison of the output characteristics of state-of-the-art solution-based chemical-modified TENG as well as the present work.

Source	Modification method	Contact area [cm <sup>2</sup> ]	Power density [W/m <sup>2</sup> ]	Durability [cycles]
This work	Electrostatic self-assembled layer	25	57.1	240,000
Reference 1	Self-assembled monolayer	4	55	5,000
Reference 2	ICP etching, spin coating	16	16.5	Not report
Reference 3	Bulk functionalities	4	7.05	10,800
Reference 4	Self-assembled monolayer	6	1.8	50,000
Reference 5	Asymmetric ion doping	4	1.4	30,000
Reference 6	Supramolecular self-assembly	6	0.42	50,000



**Fig. S1**  $V_{oc}$  output of the of the as-fabricated TENG.

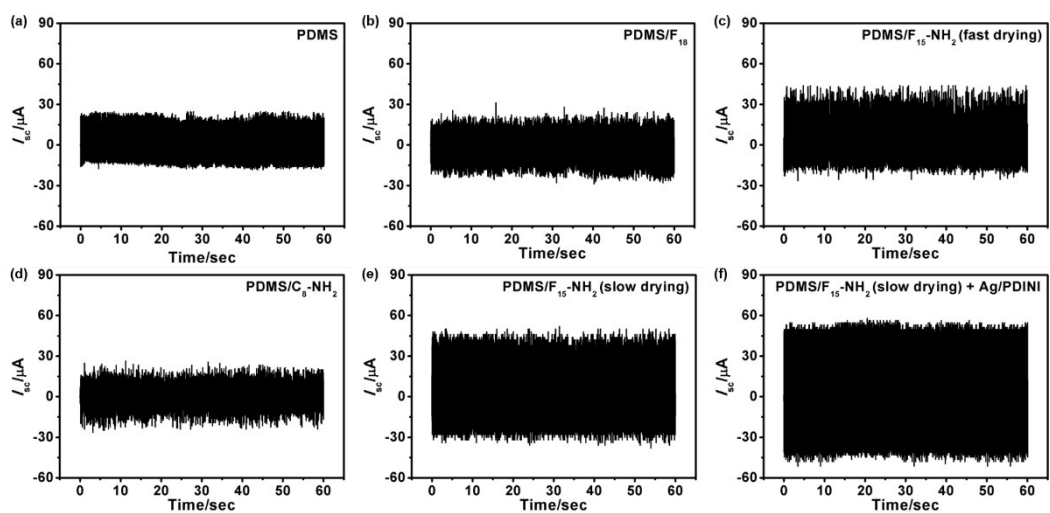


Fig. S2  $I_{sc}$  output of the as-fabricated TENG.

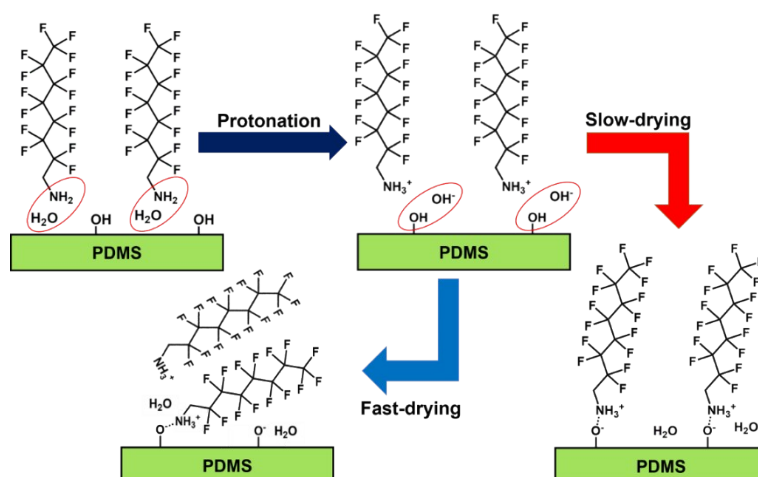


Fig. S3 Schematic illustration of the formation of  $F_{15}\text{-NH}_2$  layer on the PDMS surface via electrostatic self-assembly.

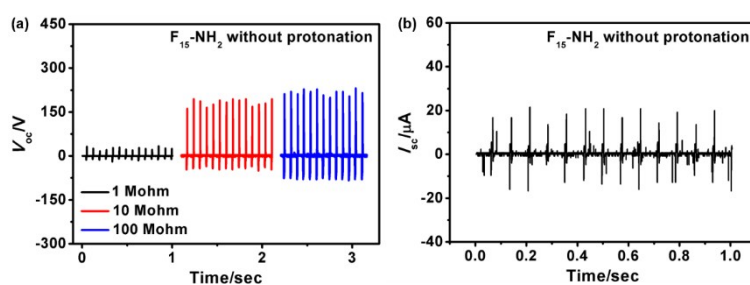


Fig. S4 Output characteristics of the as-fabricated TENG based on  $F_{15}\text{-NH}_2$  layer without protonation treatment.

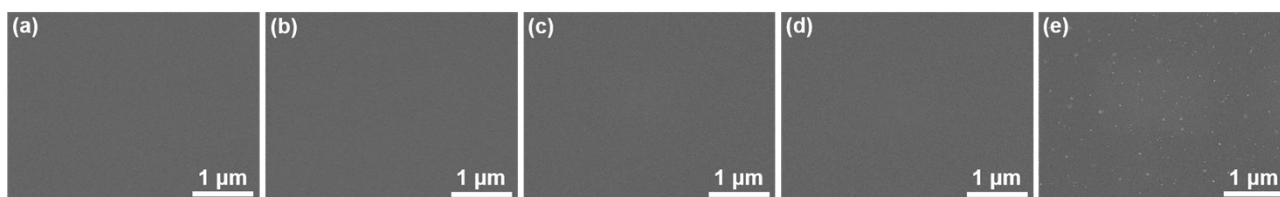
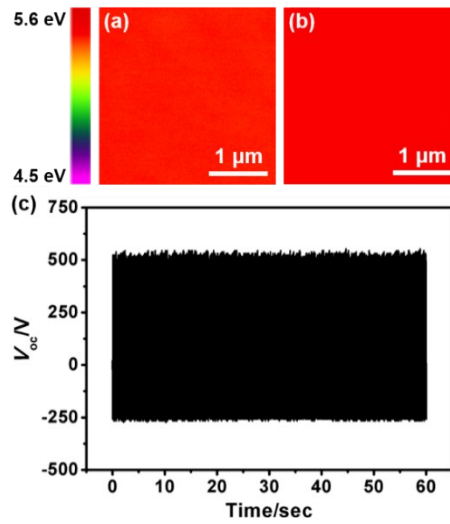
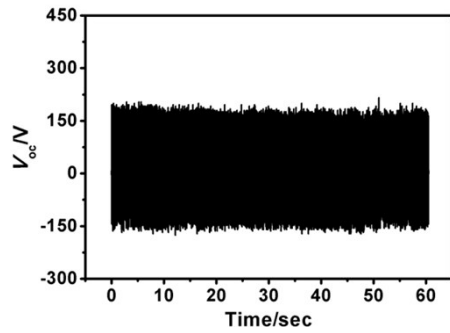


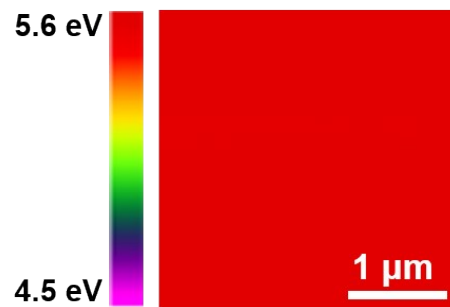
Fig. S5 Top view SEM images of dielectric layers: (a) bare PDMS, (b) PDMS/ $F_{18}$ , (c) PDMS/fast-dried  $F_{15}\text{-NH}_2$ , (d) PDMS/ $C_8\text{-NH}_2$ , (e) PDMS/slow-dried  $F_{15}\text{-NH}_2$ .



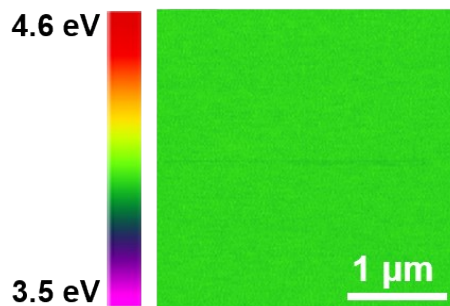
**Fig. S6** KPFM images of PMDS layer functionalized with F<sub>15</sub>-NH<sub>2</sub>: (a) before and (b) after rinsing with dimethyl sulfoxide. (c) V<sub>oc</sub> output of the as-fabricated TENG based on F<sub>15</sub>-NH<sub>2</sub> layer that is rinsed with dimethyl sulfoxide.



**Fig. S7** V<sub>oc</sub> output of the as-fabricated TENG based on F<sub>18</sub> layer that is rinsed with n-heptane.



**Fig. S8** KPFM image of PMDS layer functionalized with F<sub>15</sub>-NH<sub>2</sub> after 100,000 working cycles.



**Fig. S9** KPFM image of Al layer

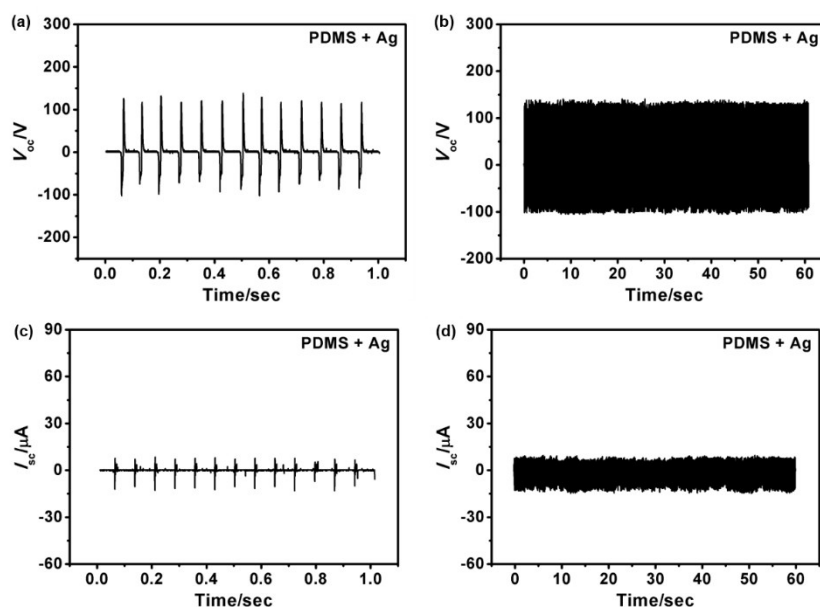


Fig. S10 Output characteristics of the as-fabricated TENG. Note that the electrode is Ag layer.

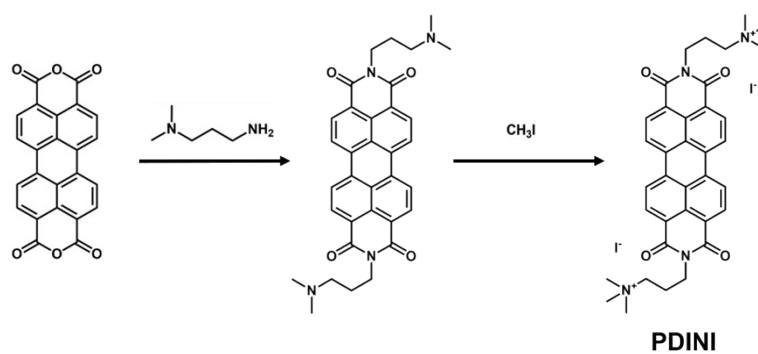


Fig. S11 Synthesis scheme for the preparation of PDINI.

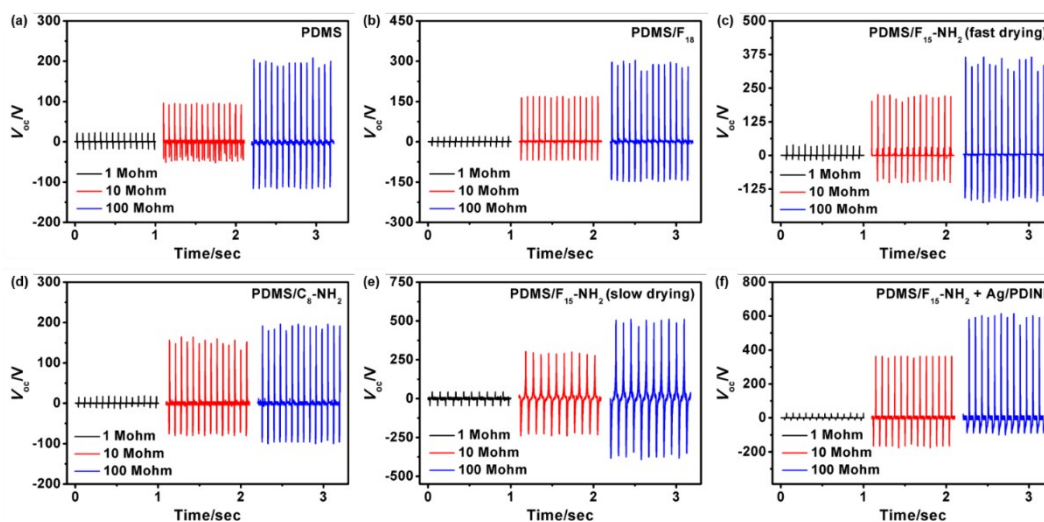


Fig. S12  $V_{oc}$  output of the as-fabricated TENG measured under different load resistances.

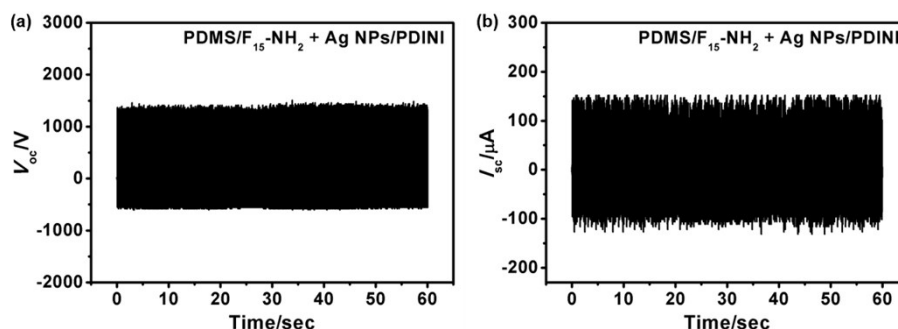


Fig. S13 Output characteristics of the as-fabricated TENG with  $F_{15}\text{-NH}_2$  and PDINI modification.

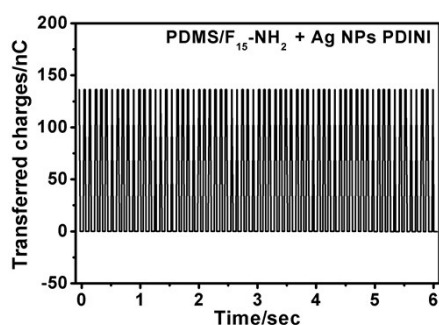


Fig. S14 Transferred charges of the as-fabricated TENG with  $F_{15}\text{-NH}_2$  and PDINI modification.

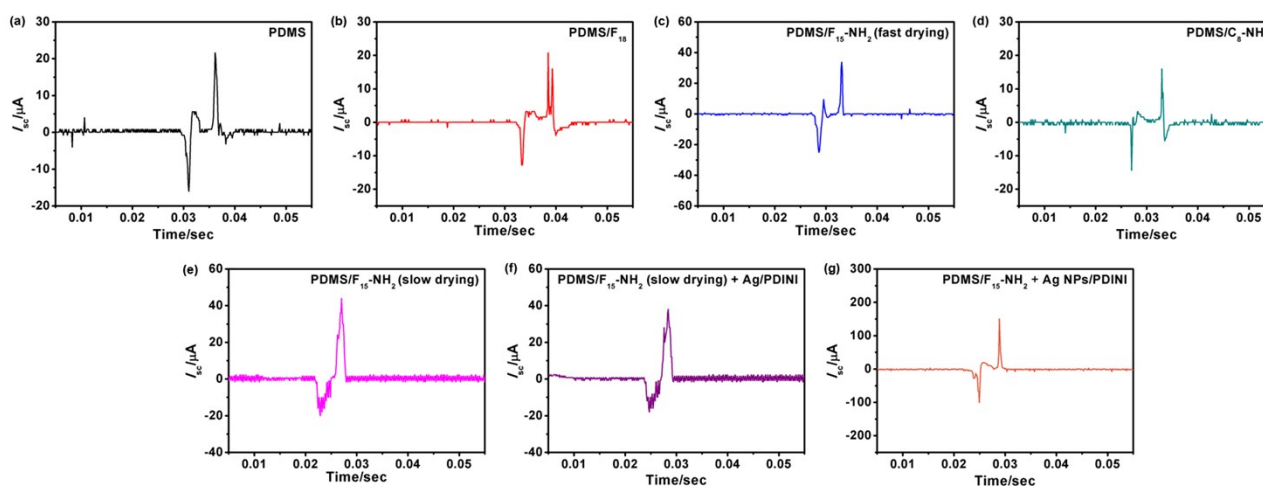


Fig. S15  $I_{sc}$  output of the as-fabricated TENG generated in one cycle.

## References

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