Electronic Supplementary Material (ESI) for Nanoscale.

High-stretchable hydroxyapatite bionanocomposite for high-performance triboelectric nanogenerators

Thien Trung Luu[1], Nghia Dinh Huynh[1], Hakjeong Kim[1], Zong-Hong Lin*[2], Dukhyun Choi*[1]

[1]School of Mechanical Engineering, College of Engineering, Sungkyunkwan University, 2066, Seobu-ro, Jangan-gu, Suwon, Gyeonggi 16419, South Korea

[2]Department of Biomedical Engineering, National Taiwan University, Taipei, 10617, Taiwan

*Corresponding author. Email address: bred96@skku.edu (D. Choi)

Movie S1: Vertical contact mode LED lighting (corresponds to Fig. 5c)

Movie S2: Portable electronic calculator charging (corresponds to Fig. 5d)

Movie S3: Tapping on lap to harvest electrical output (corresponds to Fig. 6a)

Movie S4: Tapping on cloth to harvest electrical output (corresponds to Fig. 6a)

Movie S5: Tapping on forearm to harvest electrical output (corresponds to Fig. 6a)

Movie S6: Running. HA/PDMS-TENG on sandal to light LEDs (corresponds to Fig. 6c)

Movie S7: Running. HA/PDMS-TENG on sandal to charge capacitor (corresponds to Fig. 6c)

Movie S8: Finger bending. Rubber gloves with HA/PDMS-TENG (corresponds to Fig. 6d)

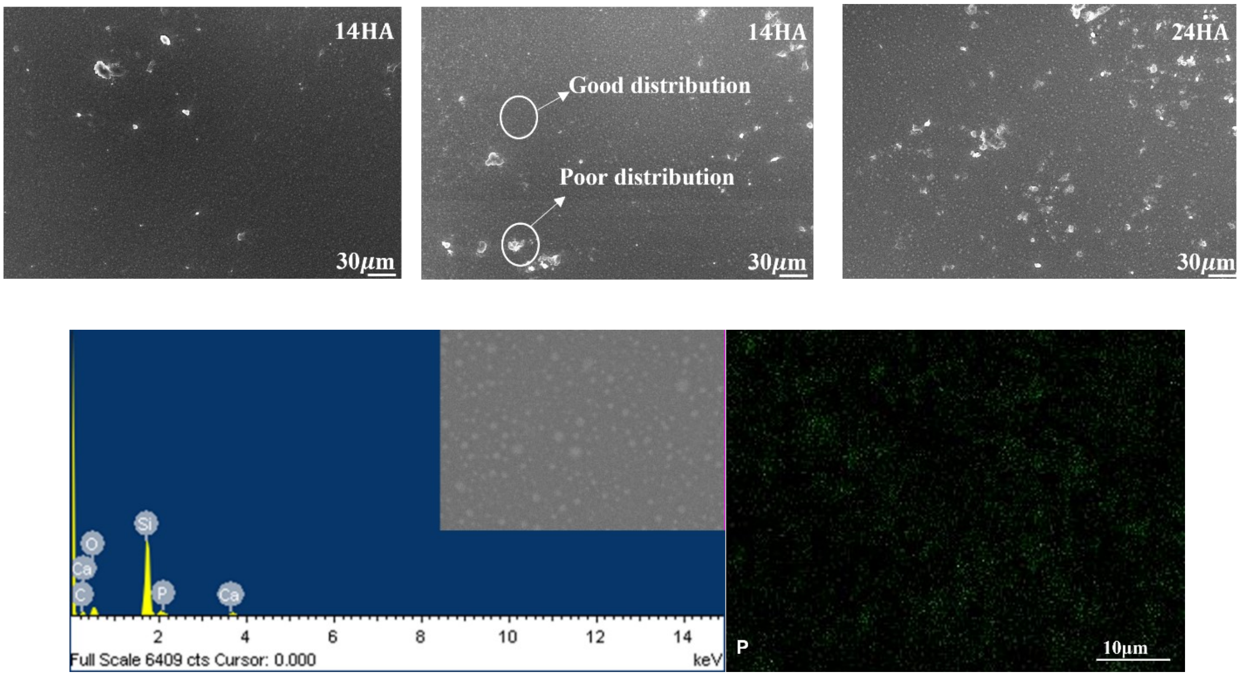

Fig. S1. FE-SEM, EDS, element mapping images of the HA/PDMS bionanocomposite films with different HA loadings.

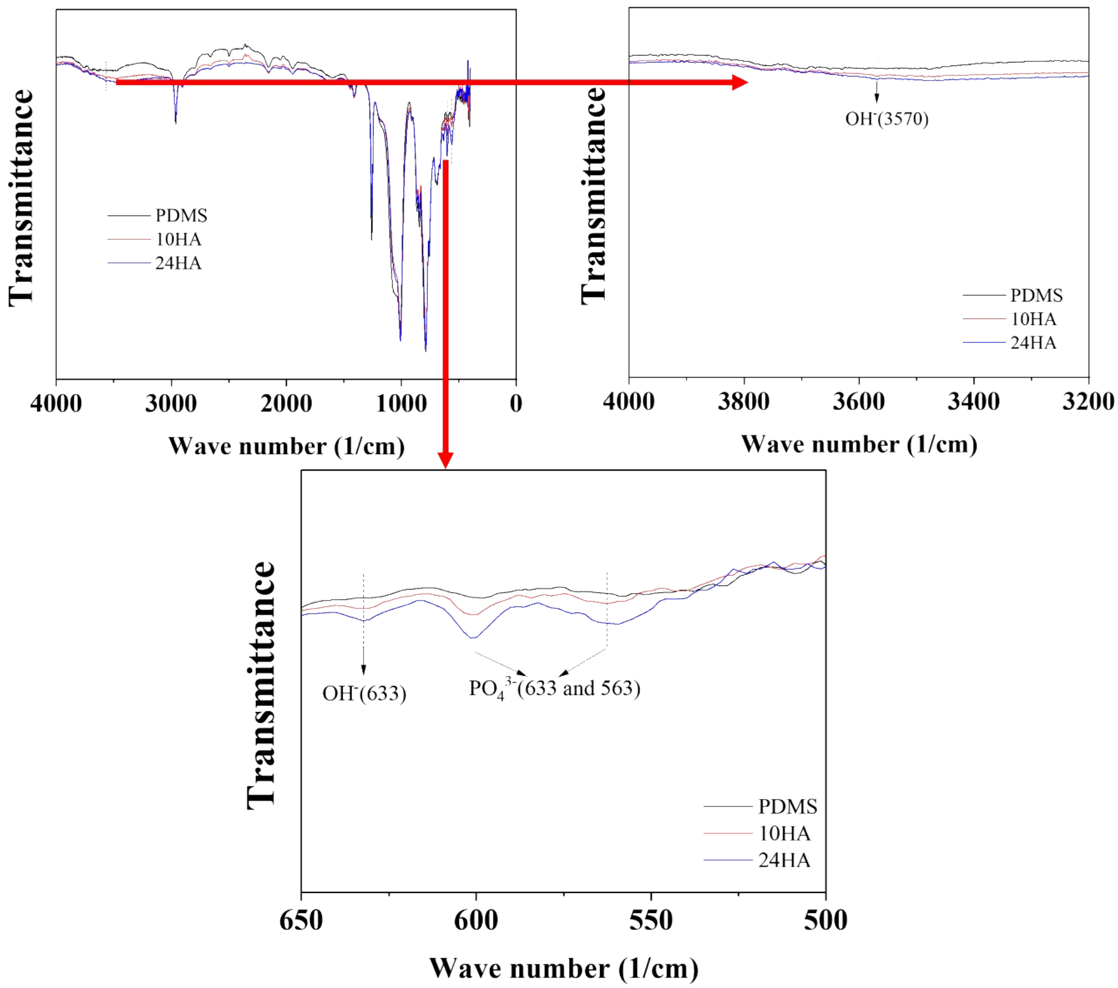

Fig. S2. ATR-FTIR spectra of HA/PDMS with different amounts of hydroxyapatite.

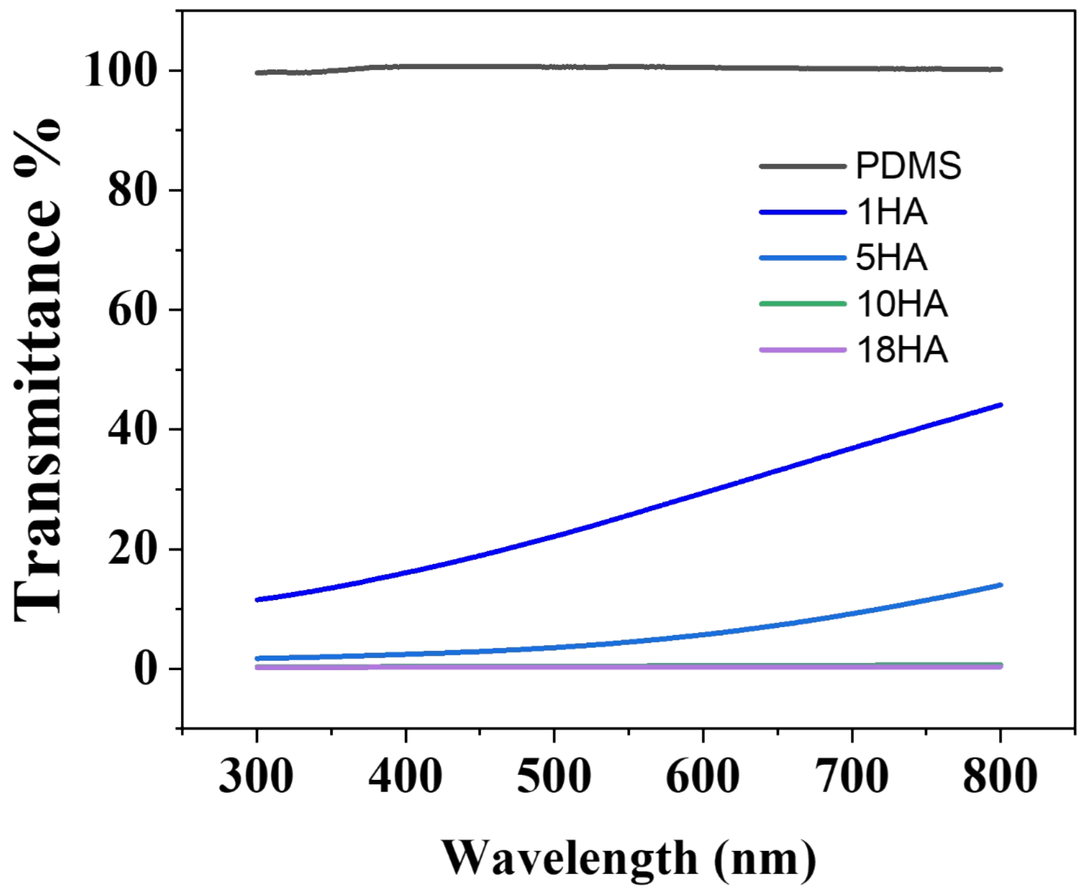

Fig. S3. UV-vis light transmittance spectra of HA/PDMS films with different contents of hydroxyapatite.

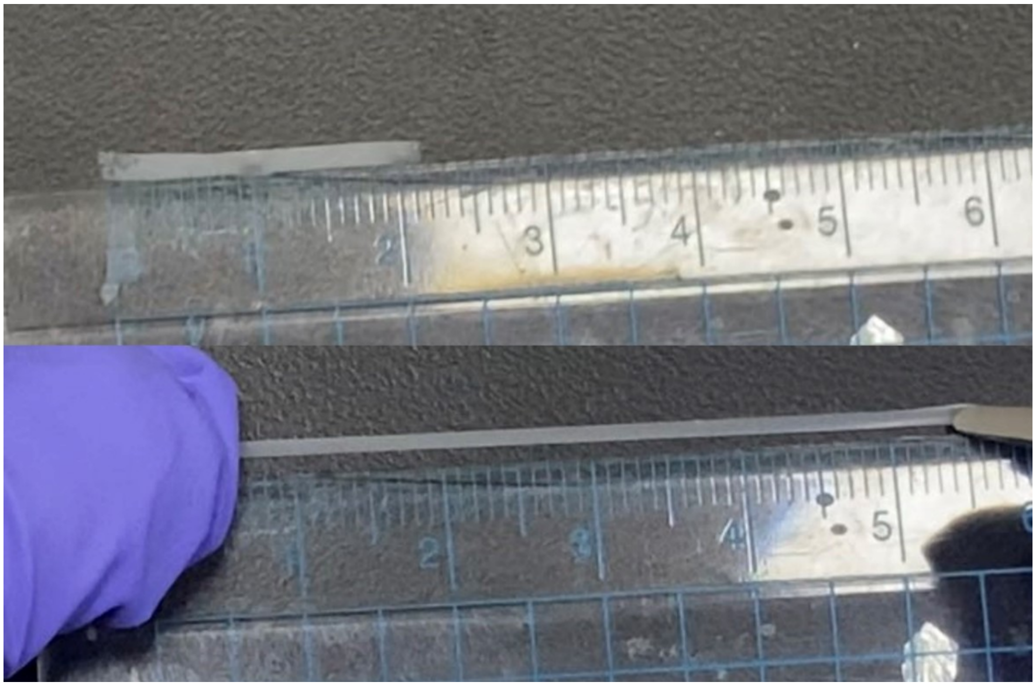

Fig. S4. Digital image of 10HA/PDMS before and after stretching.

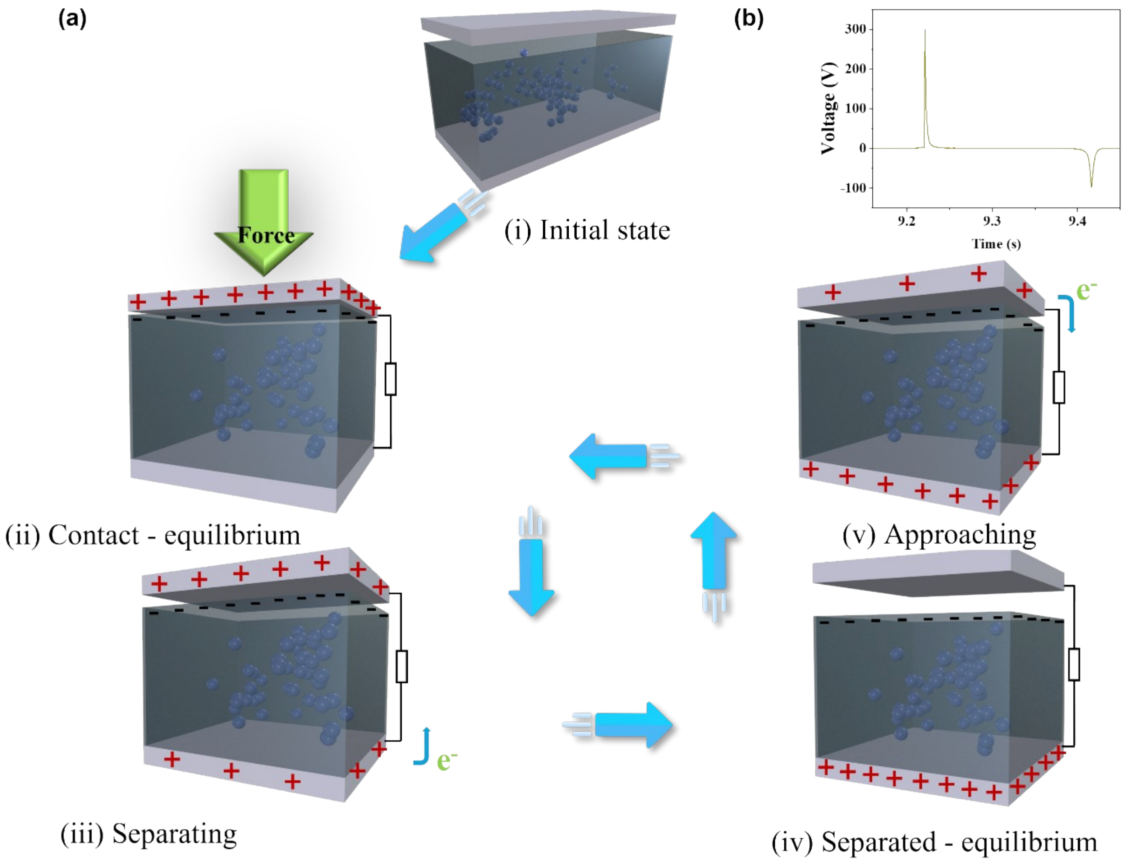

Fig. S5. (a) Schematic illustration of the power generation principle of the HA/PDMS-TENG. (b) Typical output voltage signal for one pressing and releasing cycle.

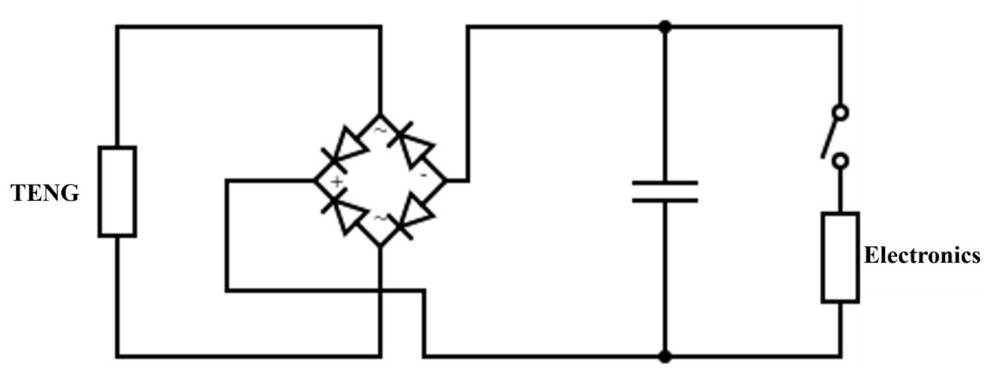

Fig. S6. The circuit diagram for driving a commercial calculator.

Table S1. HA/PDMS-TENG compared with previously reported high-dielectric constant material-based TENGs.

TM film	Voltage [V]	Current [μA]	Power density [W/m^2]	Size [cm^2]	Reference
Graphene oxide/porous PDMS	140.4	2.57	3.73	0.35	[1]
$ZnSnO_3$ nanocubes /(PDMS)	400	28	7.5	9	[2]
PDMS/$ZnSnO_3$)/MWCNT	475	36	10.5	4	[3]
PDMS/$NiTe_2$ NB	197	86.4	18.9	9	[4]
$SrBaTiO_3$/PDMS	280	8.5	4.41	4	[5]
Mustard seed	126	-	0.334	-	[6]
Silk	280	17.3	14.4	4	[7]
HA/PDMS (This work)	**300**	**22.4**	**27.34**	**4**	**Our work**

References

1. C. R. Yang, C. T. Ko, S. F. Chang and M. J. Huang, Nano Energy, 2022, 92.
2. G. Wang, Y. Xi, H. X. Xuan, R. C. Liu, X. Chen and L. Cheng, Nano Energy, 2015, 18, 28-36.
3. S. Feng, H. L. Zhang, D. L. He, Y. G. Xu, A. N. Zhang, Y. Liu and J. B. Bai, Energy Technol-Ger, 2019, 7.
4. Y. T. Qian, Z. Lyu, D. H. Kim and D. J. Kang, Nano Energy, 2021, 90.
5. M. V. Paranjape, S. A. Graham, P. Manchi, A. Kurakula and J. S. Yu, Small, 2023.
6. S. K. Singh, P. Kumar, R. Magdum, U. Khandelwal, S. Deswal, Y. More, S. Muduli, R. Boomishankar, S. Pandit and S. Ogale, Acs Appl Bio Mater, 2019, 2, 3164-3170.
7. B. Dudem, S. A. Graham, R. D. I. G. Dharmasena, S. R. P. Silva and J. S. Yu, Nano Energy, 2021, 83