Supporting Information

High Energy Storage Density and Low Energy Loss Inspired by Inserting Charge Traps in all Organic Dielectric Materials

Meirong Zhang[a], Bofeng Zhu[c], Xiao Zhang[c], Shaobo Tan[a], Honghong Gong[a], Xiaoyong Wei[b], Zhicheng Zhang[a]**

a Department of Applied Chemistry, Xi'an Key Laboratory of Sustainable Energy Materials Chemistry, School of Chemistry, Xi'an Jiaotong University, Xi'an 710049, P. R. China

b Electronic Materials Research Laboratory, Key Laboratory of the Ministry of Education and International Center for Dielectric Research, School of Electronic and Information Engineering, Xi'an Jiaotong University, Xi'an 710049, P. R. China

c National Key Laboratory of Science and Technology on Vessel Integrated Power System, Naval University of Engineering, Wuhan 430034, P. R. China

[*]Corresponding Authors. E-mail: wdy@mail.xjtu.edu.cn; (X.Y. Wei)

[**]Corresponding Authors. E-mail: zhichengzhang@mail.xjtu.edu.cn; (Z.C. Zhang)

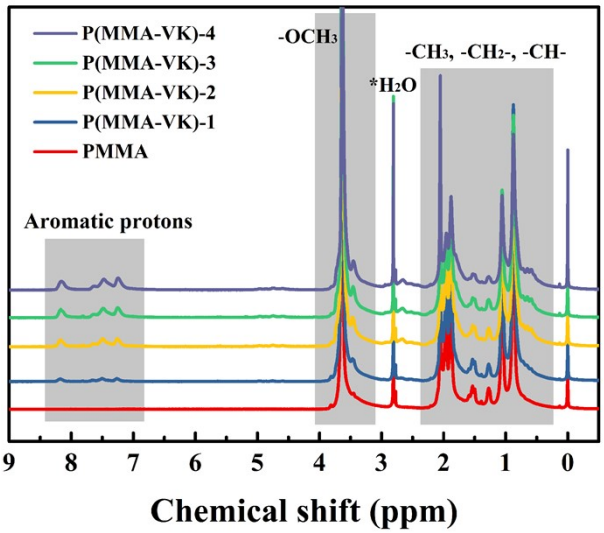

Figure S1. ^{1}H NMR spectra of the prepared polymers.

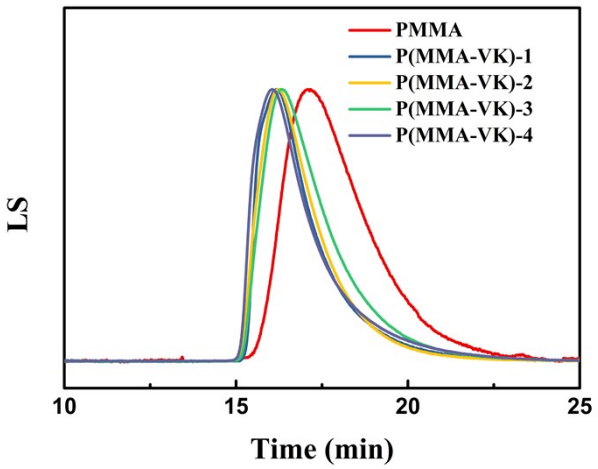

Figure S2. GPC traces recorded for the prepared polymers.

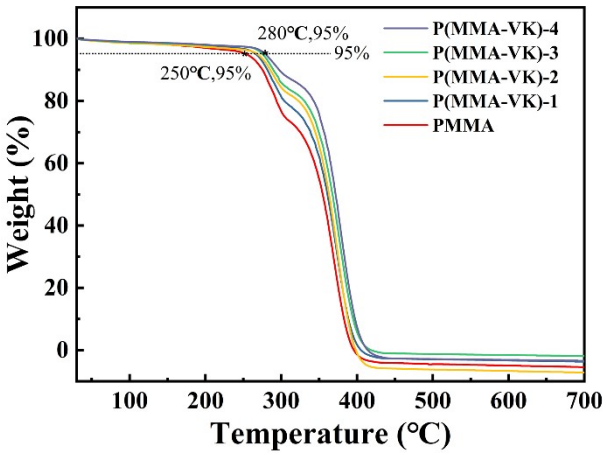

Figure S3. TGA traces of the prepared polymers.

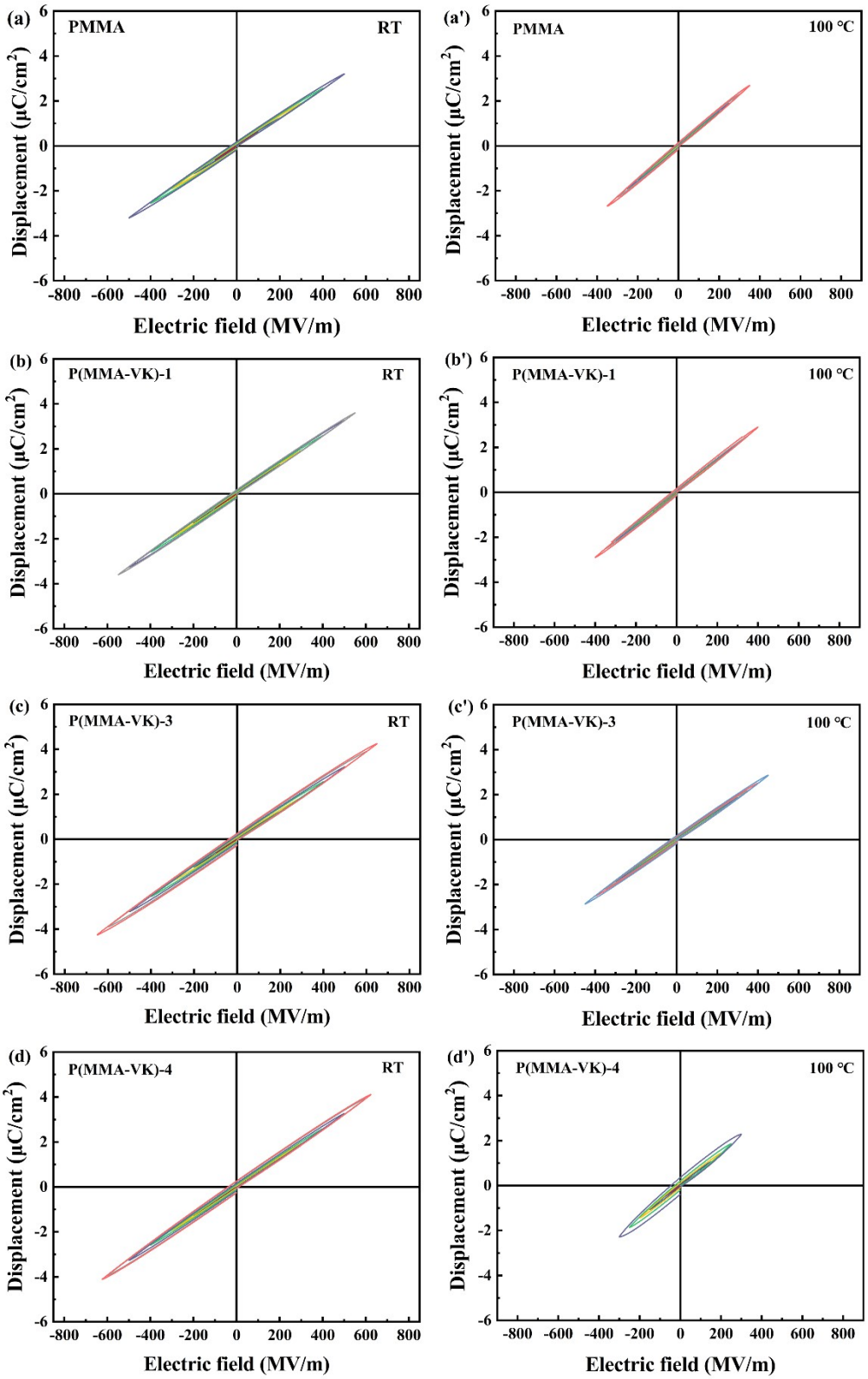

Figure S4. Bipolar *D-E* loops at room temperature for (a) PMMA, (b) P(MMA-VK)-1, (c) P(MMA-VK)-3, (d) P(MMA-VK)-4, and at 100°C for (a') PMMA, (b') P(MMA-VK)-1, (c') P(MMA-VK)-3, (d') P(MMA-VK)-4.

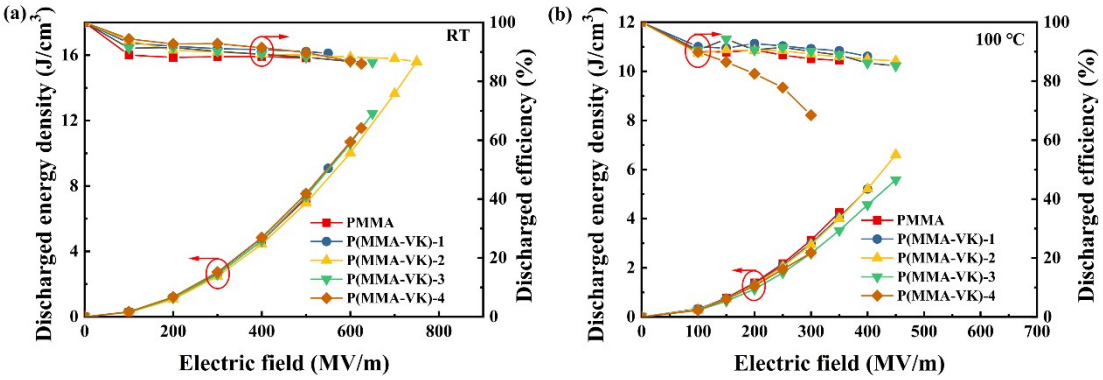

Figure S5. Discharged energy density and discharging efficiency of the prepared polymers at ambient temperature and 100°C.

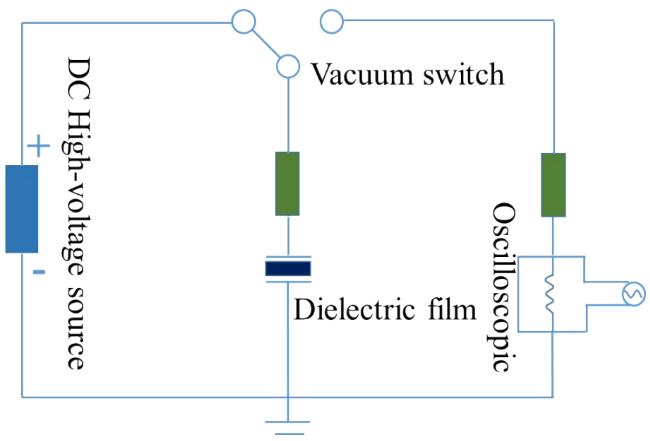

Figure S6. Schematic circuit of the discharge experiment.

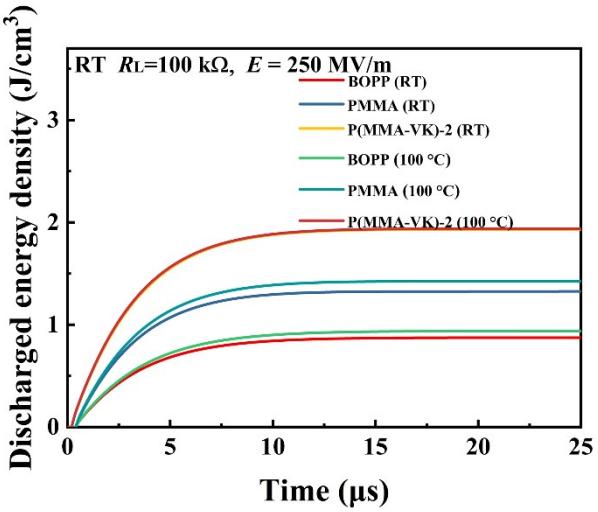

Figure S7. Discharged energy density of the prepared polymer and commercial BOPP.

The breakdown strength measurement of each component of P(MMA-VK) are repeated 20 times, and the measurement results are analyzed by two-parameter Weibull distribution statistics as presented in equation (S1), where α is the parameter with respect to 63.2% probability of breakdown (for x = α, F(x) = 0.632) and parameter β give a description of breakdown strength distribution.

$$F(x) = 1 - \exp[-(\frac{x}{a})^b] \quad \text{(S1)}$$

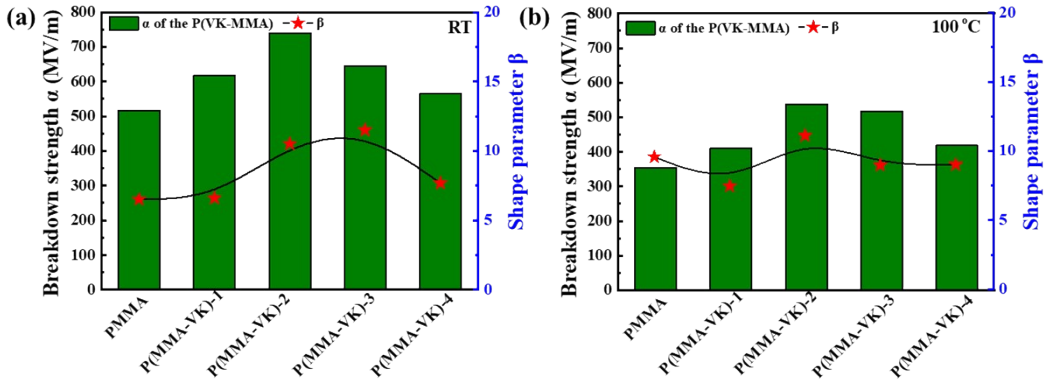

Figure S8. Breakdown strength α and shape parameter β of the prepared polymers at ambient temperature and 100°C.

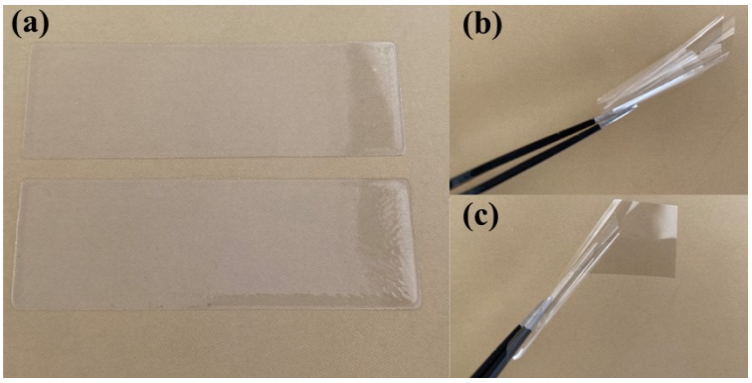

Figure S9. (a) Digital image of P(MMA-VK)-2 film with a thickness of 12 μm and its digital images after (b) wrapping and (c) folding.

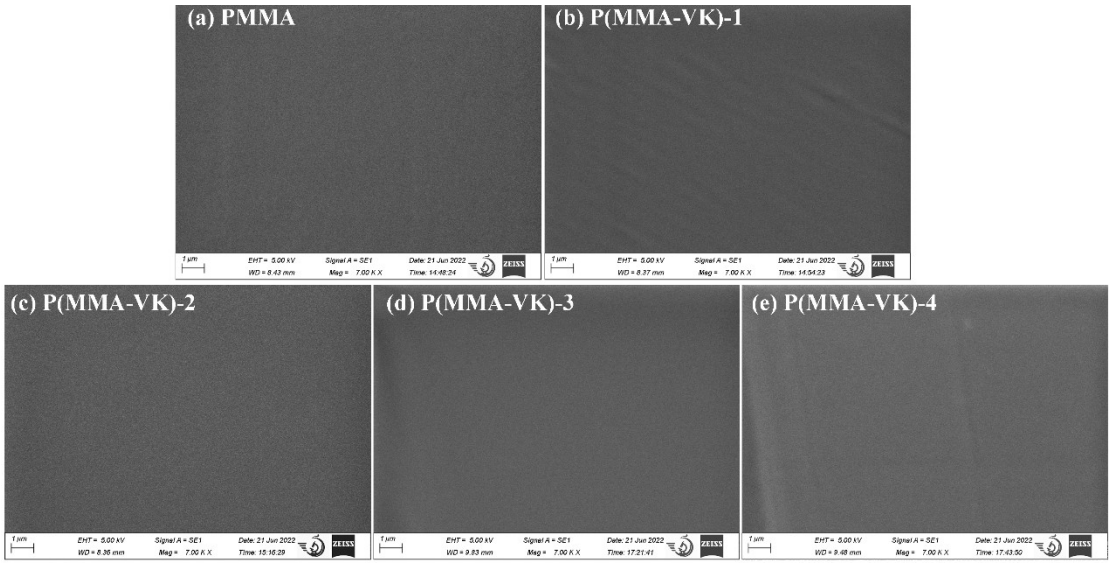

Figure S10. SEM images of (a) PMMA, (b) P(MMA-VK)-1, (c) P(MMA-VK)-2, P(MMA-VK)-3, and P(MMA-VK)-4.

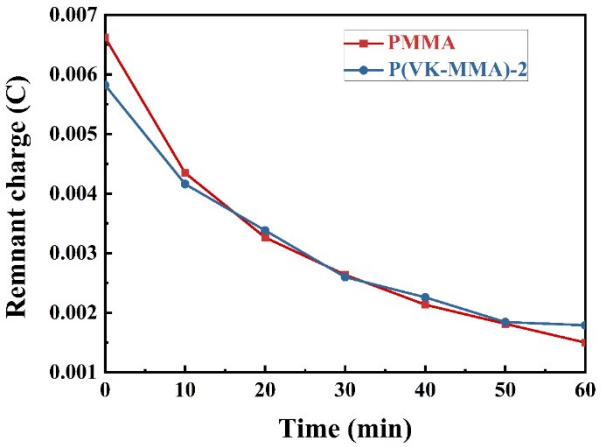

Figure S11. The remnant charge over time after removing the applied field for PMMA and P(MMA-VK)-2.