Tailoring a Multifunctional Poly Glutamic Acid-Tragacanth Gum Binder for Enhancing the Lithium Storage Performance of Red Phosphorus Anode

Yanting Li,[1] Bin Zhang,[,3] Moyuan Cao,[4] Xu Liang,[1] Kar Ban Tan,[5] Shaojie Zhang,[1] Yidian Dong,[1] Yujie Wang,[1] Yiming Zhang,[1] Haochen Gong,[1] Hui Rong,[1] Anjie Dong,[1] Xinpeng Han, [1] Fengmin Jin,[*,1] Jie Sun[*,1,2]*

[1]School of Chemical Engineering and Technology, Tianjin University, Tianjin, 300350, China.

[2]Quzhou Institute for Innovation in Resource Chemical Engineering, Zhejiang 324000, China.

[3]Beijing Guxin Energy Technology Company, Beijing, 100160, China.

[4]School of Materials Science and Engineering, Nankai University, Tianjin, 300350, China.

[5]Department of Chemistry, Faculty of Science, Universiti Putra Malaysia, 43400 UPM, Serdang, Malaysia

Corresponding Author: Bin Zhang, Email: 791655369@qq.com; Fengmin Jin, Email: fmjin@tju.edu.cn; Jie Sun, Email: sunjie_0023@163.com

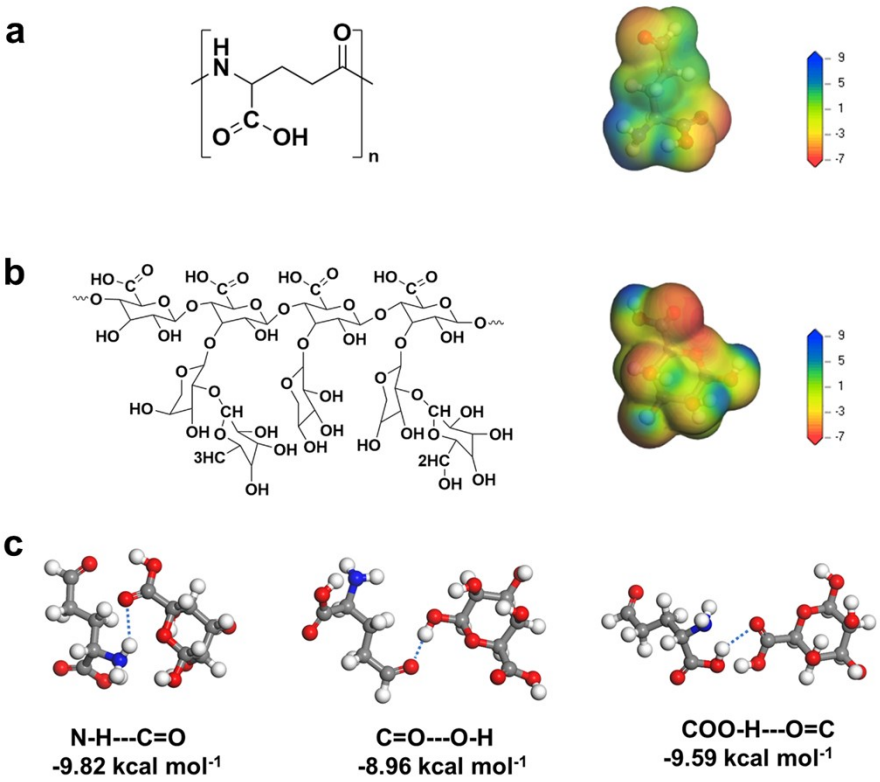

Figure S1. The molecular structure and electrostatic potential of PGA a) and TG b). c) The intermolecular hydrogen-bond type and bond energies calculated by DFT simulations.

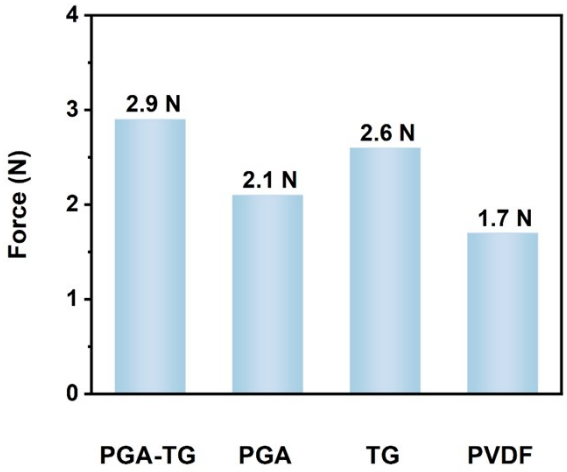

Figure S2. The average peeling forces of PGA-TG, PGA, TG, PVDF-based electrodes.

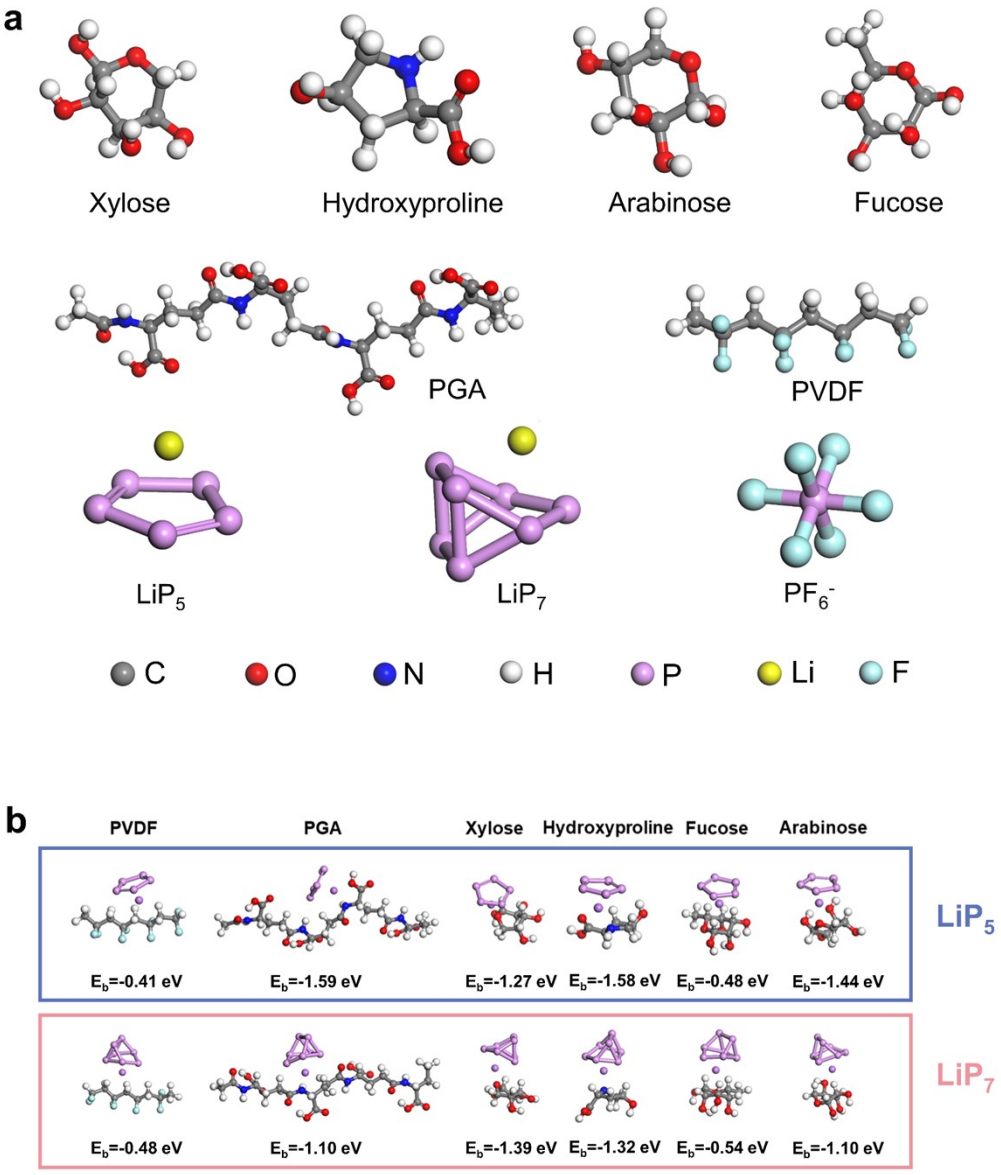

Figure S3. a) Species used in theoretical calculations. b) The adsorption conformations and calculated binding energy between different binder and LiP_5, LiP_7.

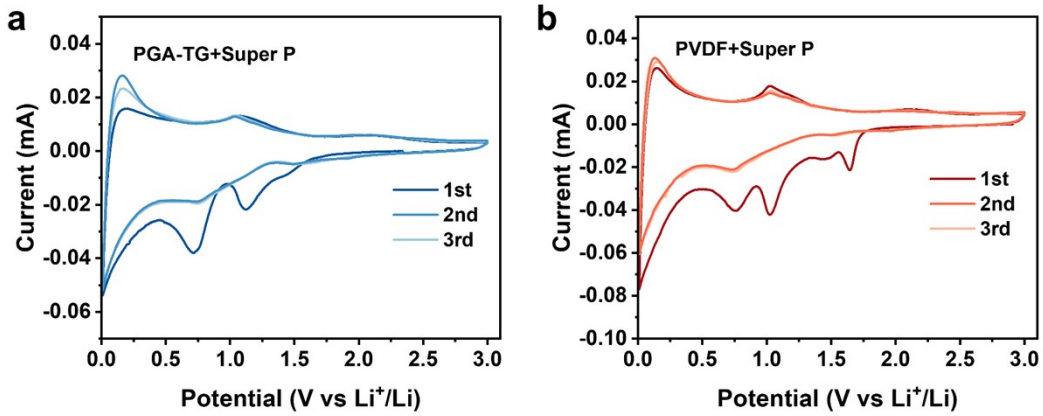

Figure S4. CV curves of PGA/TG-Super P a) and PVDF-Super P b) electrode at a scan rate of 0.1 mV s^{-1} between 0.01 and 3.0 V vs Li^+/Li.

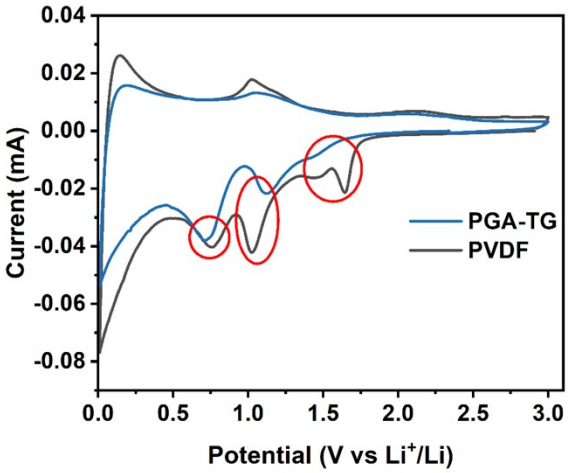

Figure S5. The first cycle CV curves of PGA/TG-Super P and PVDF-Super P electrode.

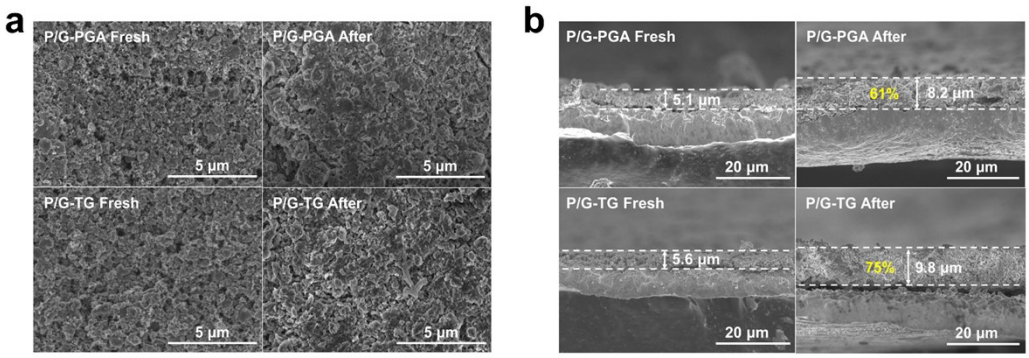

Figure S6. a) Top view and b) cross section morphologies of PGA electrode and TG electrode.

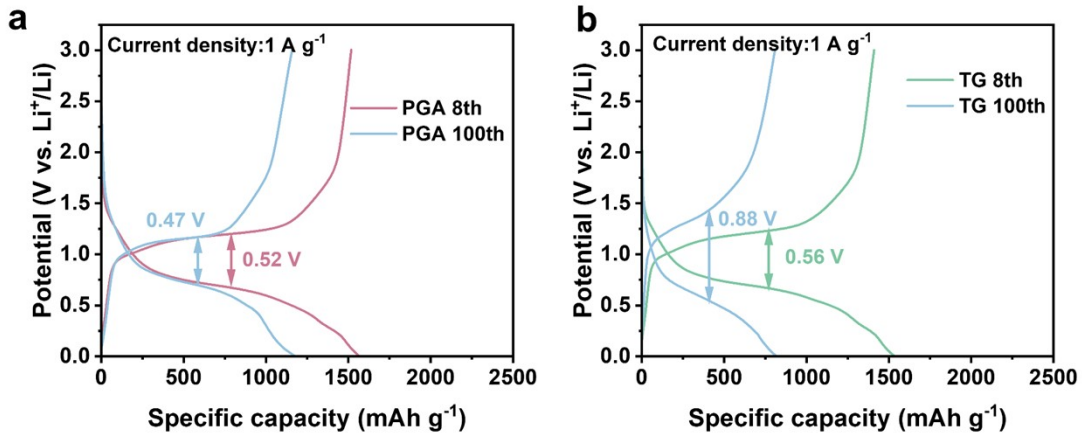

Figure S7. Galvanostatic charge and discharge curves of a) PGA electrode and b) TG electrode at 1 A g^{-1}.

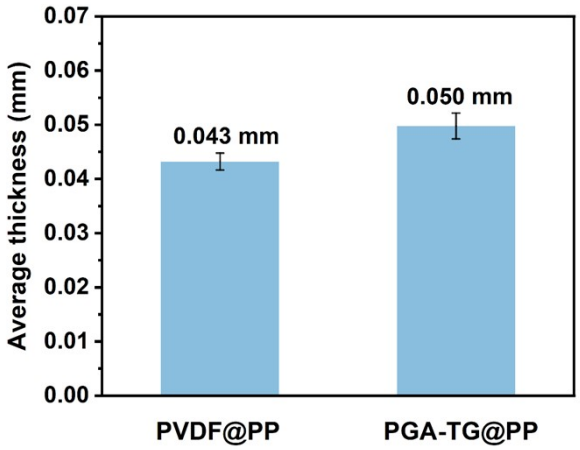

Figure S8. The average thickness of PGA-TG@PP and PVDF@PP.

Table S1. Summary of the Li^+ conductivity of PGA-TG and PVDF tested from Li-Li and steel-steel symmetric cells.

	Ion conductivity (10^{-3} S cm^{-1})	**t_{Li+}**	**Lithium ion conductivity (10^{-3} S cm^{-1})**
PGA-TG	1.23	0.529	0.65
PVDF	1.41	0.287	0.40

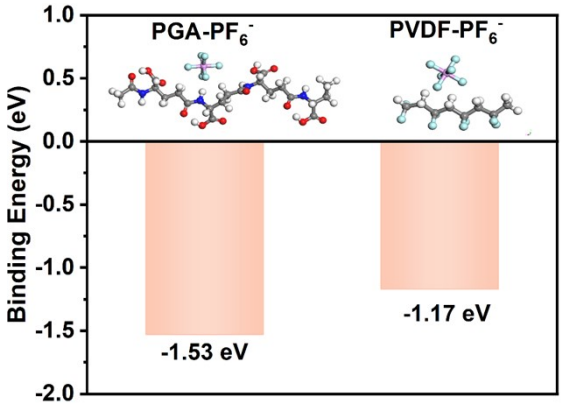

Figure S9. The adsorption ability of PF_6^- on PGA-TG and PVDF.