Preparation and utility of self-lubricating & anti-wear graphene oxide/nano-polytetrafluoroethylene Hybrid

Ting Huang[a], Tongsheng Li[a]*, Yuanshi Xin[a], Bocheng Jin[b], Zhongxin Chen[a], Chao Su[a], Haiming Chen[a] and Steven Nutt[b]

[a]State Key Laboratory of Molecular Engineering of Polymers, Department of Macromolecular Science, Fudan University, Shanghai, 200433, P. R. China and [b]Department of Chemical Engineering and Materials Science, University of Southern California, Los Angeles, CA, 90089-0214, United States.

Supplementary data

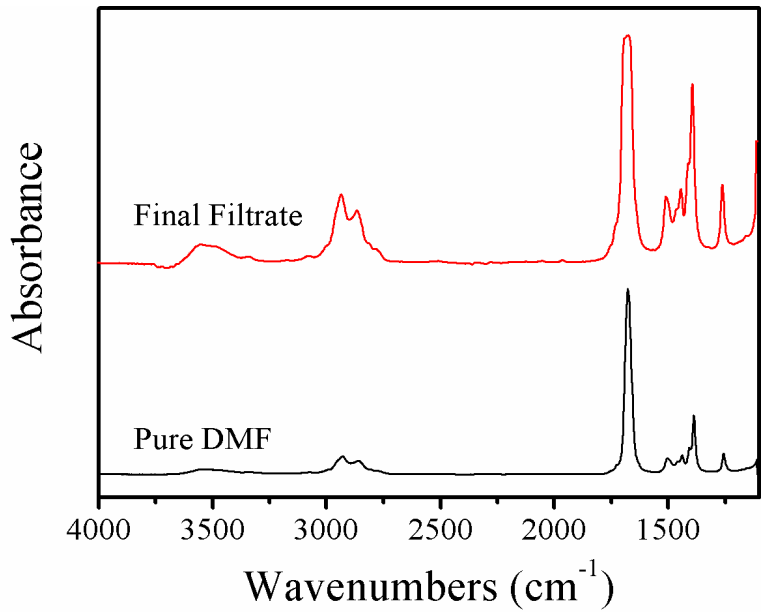

Figure S1 FTIR spectra of Final filtrate and pure DMF, respectively.

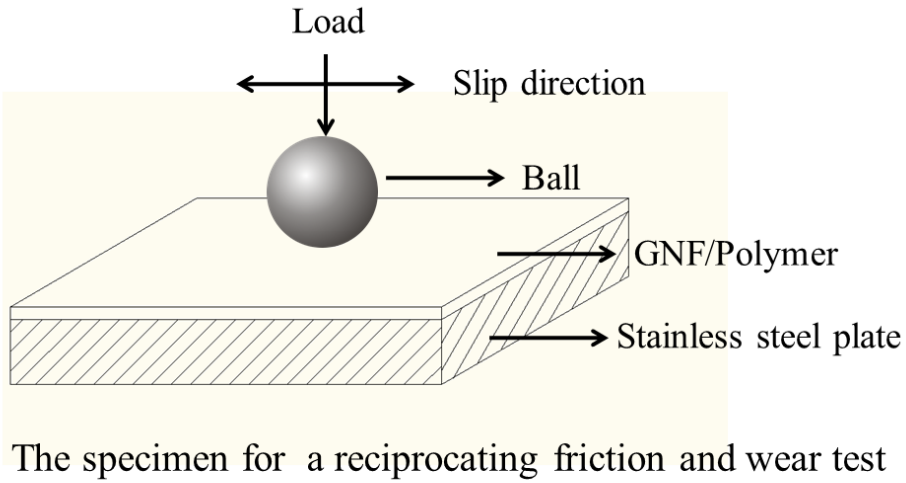

Figure S2 Schematic of the contact configuration of the reciprocating friction and wear testing machine.

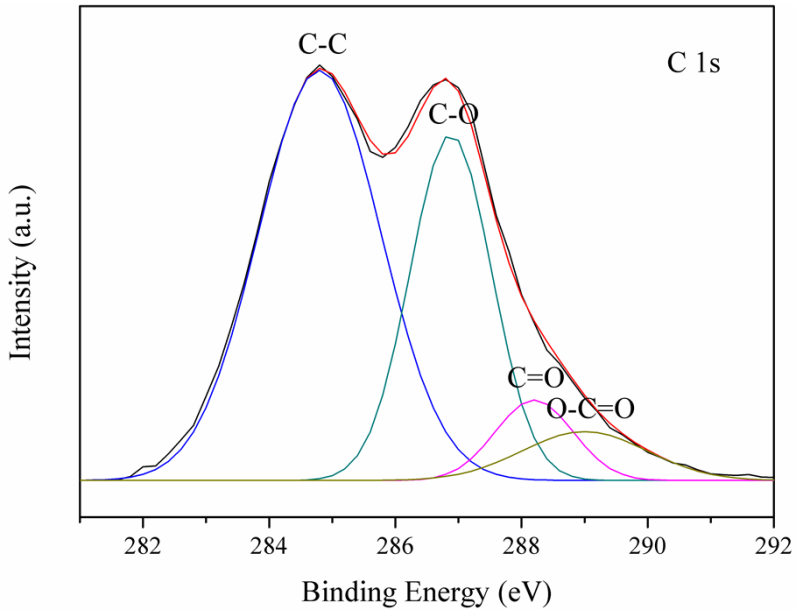

Figure S3 C 1s XPS spectrum of GO.

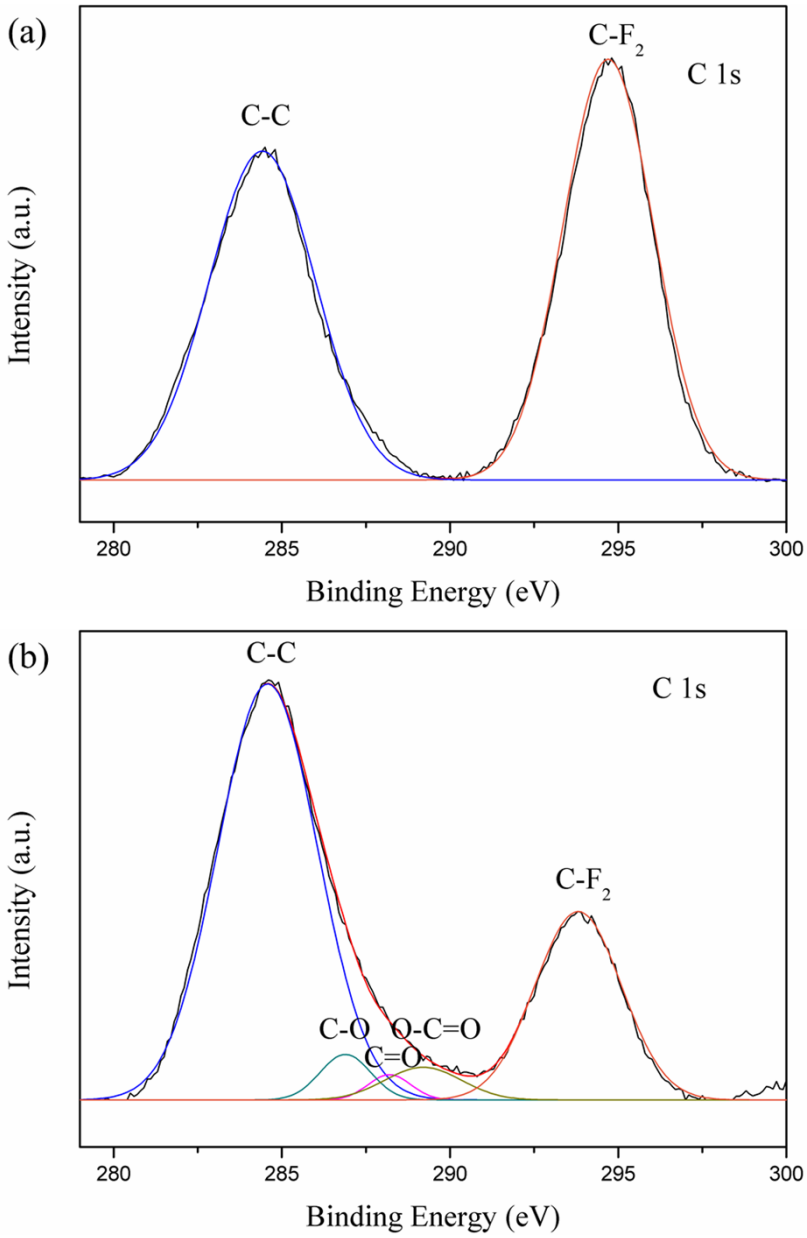

Figure S4 C 1s XPS spectra of nano-PTFE and nano-PTFE-AA.

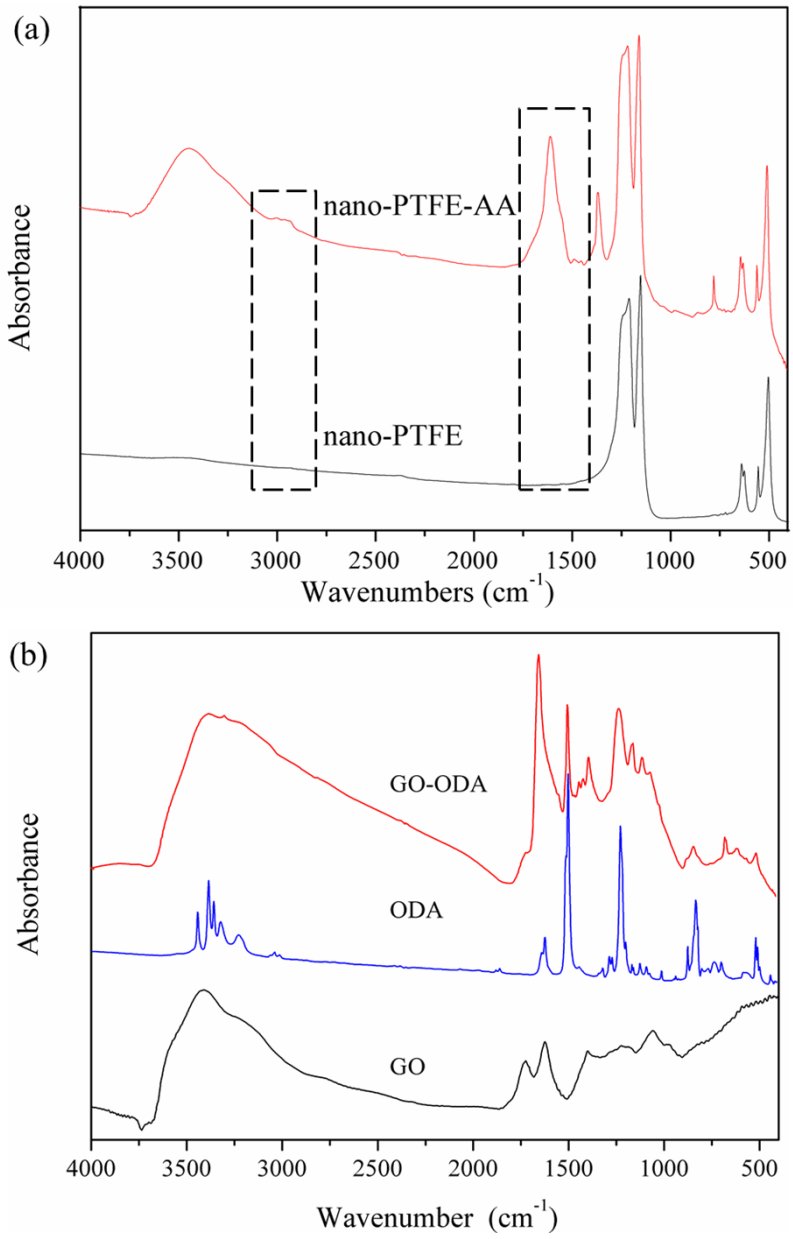

Figure S5 (a) FTIR spectra of nano-PTFE and nano-PTFE-AA; (b) FTIR spectra of GO, ODA and GO-ODA.

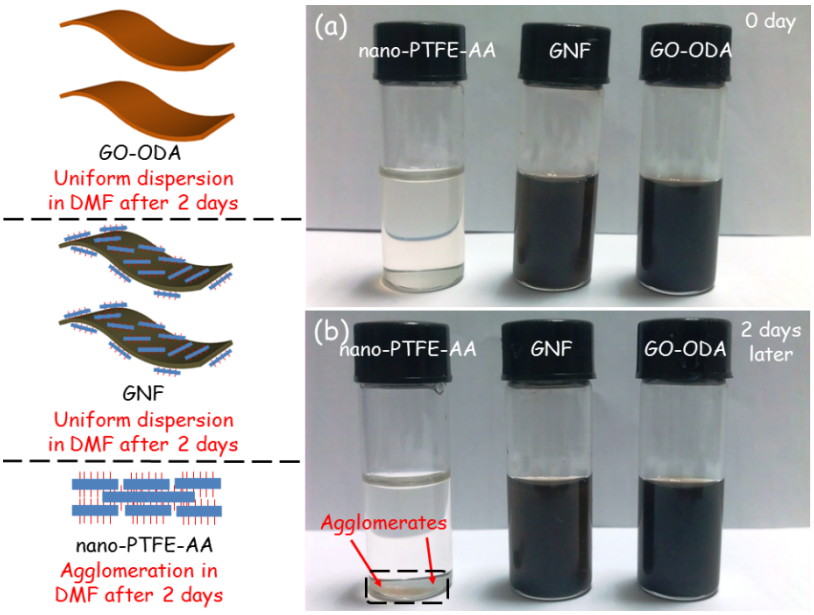

Figure S6 The dispersibility and time-dependent stability of nano-PTFE-AA, GNF, GO-ODA in DMF solvent

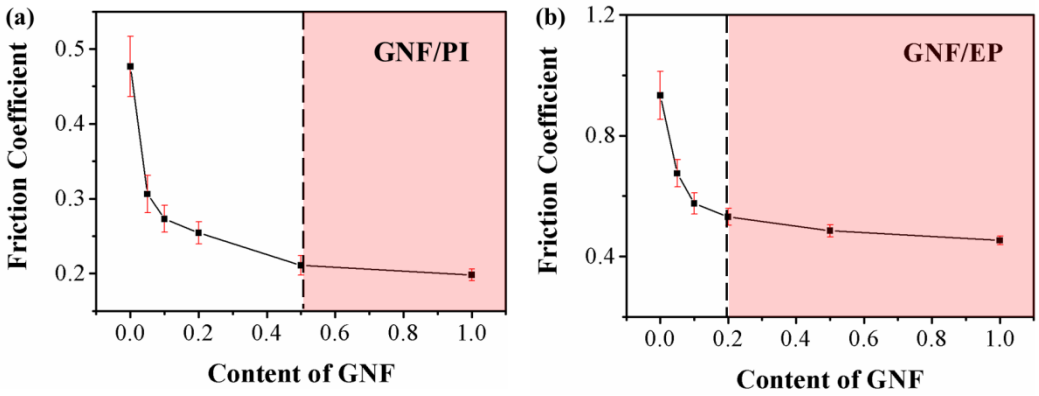

Figure S7 Relationship of average friction coefficient values for the (a) GNF/PI and (b) GNF/EP specimens with GNF content. (reciprocating frequency: 10 Hz, sliding distance: 480 m, load: 10 N, RH: 40%)

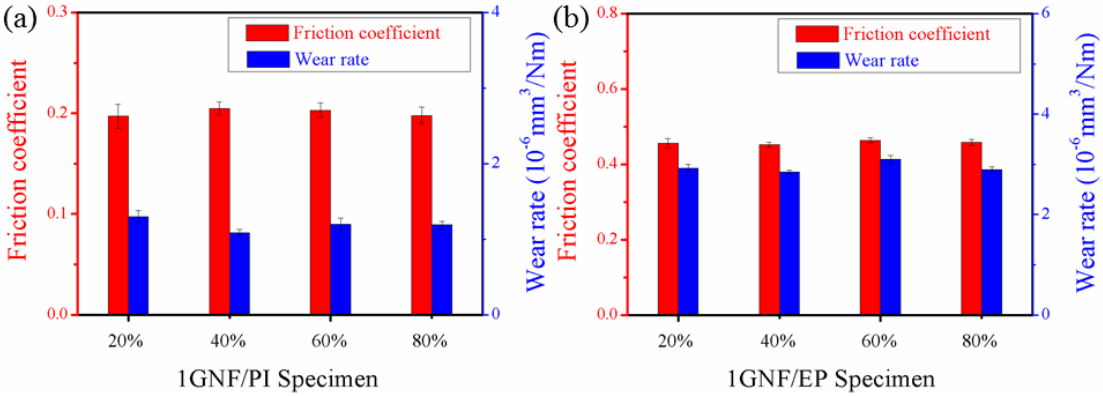

Figure S8 (a) Friction coefficient and wear rate of 1GNF/PI and 1GNF/EP specimens under various RH conditions.

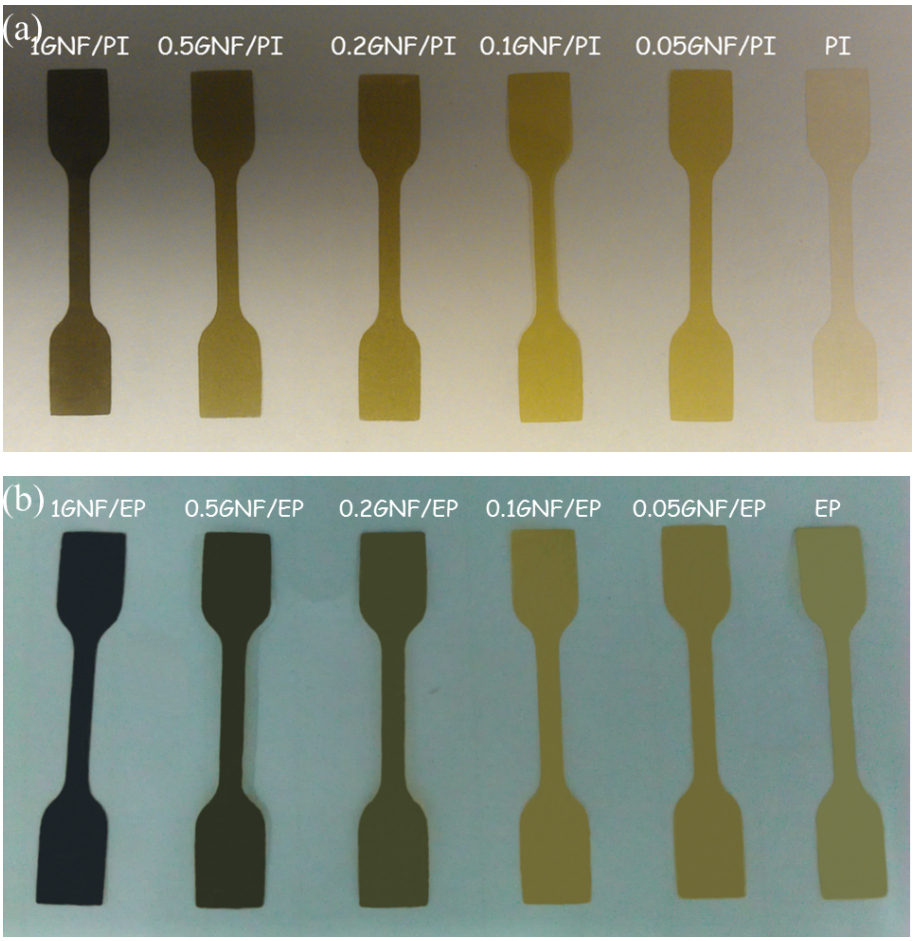

Figure S9 Appearance for dog-bone type specimens of (a) neat PI and GNF/PI, (b) neat EP and GNF/EP composite films.

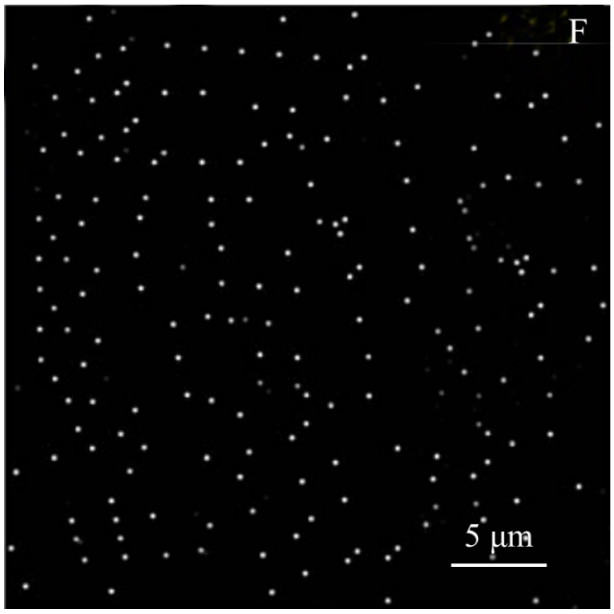

Figure S10 EDX elemental mapping of F dispersion on the counterpart.

Table S1. Tribological properties of neat PI, 1nano-PTFE-AA/PI, 1GO-ODA/PI, 1GNF/PI, neat EP, 1nano-PTFE-AA/EP, 1GO-ODA/PI and 1GNF/EP specimens.

Specimens	Friction coefficient	Wear rate (mm^3/Nm)
neat PI	0.477	1.56×10^{-4}
1nano-PTFE-AA/PI	0.285	8.96×10^{-5}
1GO-ODA/PI	0.403	1.94×10^{-5}
1GNF/PI	0.198	1.09×10^{-6}
neat EP	0.934	2.83×10^{-4}
1nano-PTFE-AA/EP	0.677	1.72×10^{-4}
1GO-ODA/EP	1.213	3.17×10^{-5}
1GNF/EP	0.458	2.90×10^{-6}

Table S2. Microhardness and tensile strength of neat PI, GNF/PI, neat EP and GNF/EP specimens.

Specimens	Microhardness (MPa)	Tensile strength (MPa)
PI	398	87
0.05GNF/PI	459	95
0.1GNF/PI	498	102
0.2GNF/PI	533	109
0.5GNF/PI	557	121
1GNF/PI	595	132
EP	277	58
0.05GNF/EP	334	64
0.1GNF/EP	365	69
0.2GNF/EP	389	74
0.5GNF/EP	408	83
1GNF/EP	423	91