Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A
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Flexible and transparent free-standing films with enhanced magnetic and luminescent anisotropy

Yibo Dou, Xiaoxi Liu, Mingfei Shao, Jingbin Han,* Min Wei

State Key Laboratory of Chemical Resource Engineering, Beijing University of Chemical Technology, Beijing 100029, P. R. China

CORRESPONDING AUTHOR FOOTNOTE

* Corresponding author. Phone: +86-10-64412131. Fax: +86-10-64425385. E-mail: hanjb@mail.buct.edu.cn.

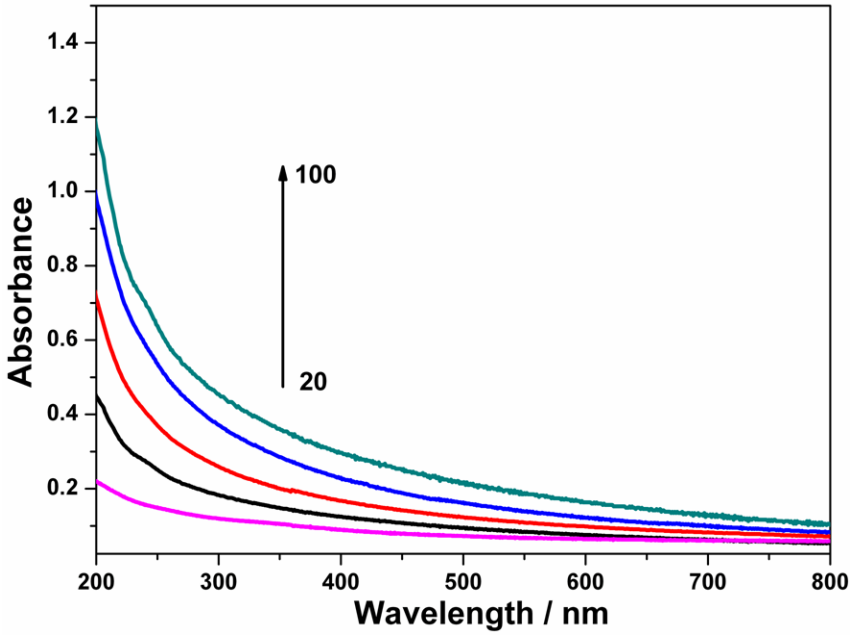

Figure S1. UV-vis spectra of the $(LDH/PVA)_n$ (n = 20, 40, 60, 80 and 100) films.

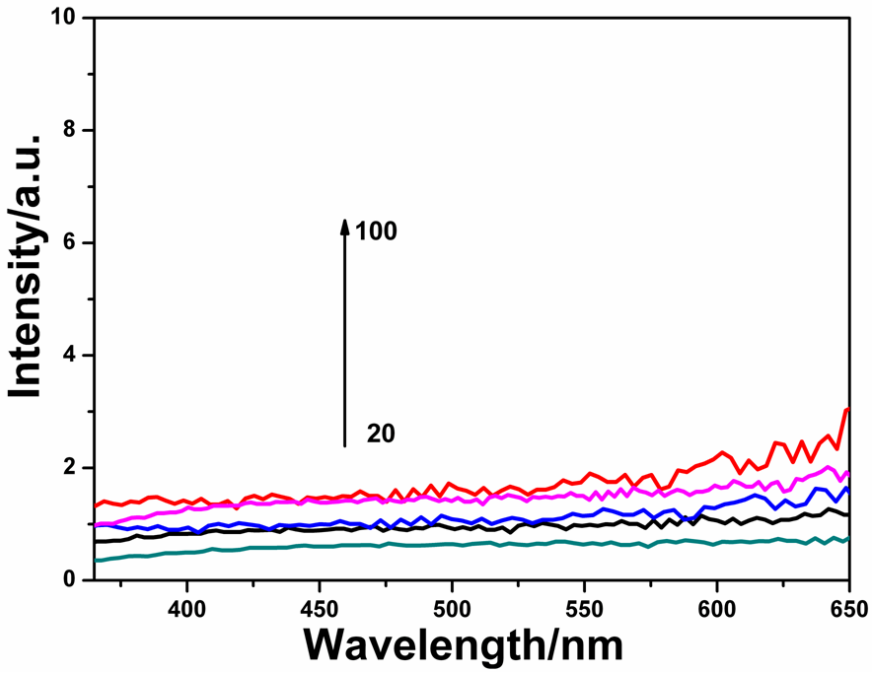

Figure S2. Fluorescence spectra of the $(LDH/PVA)_n$ (n = 20, 40, 60, 80 and 100) films.

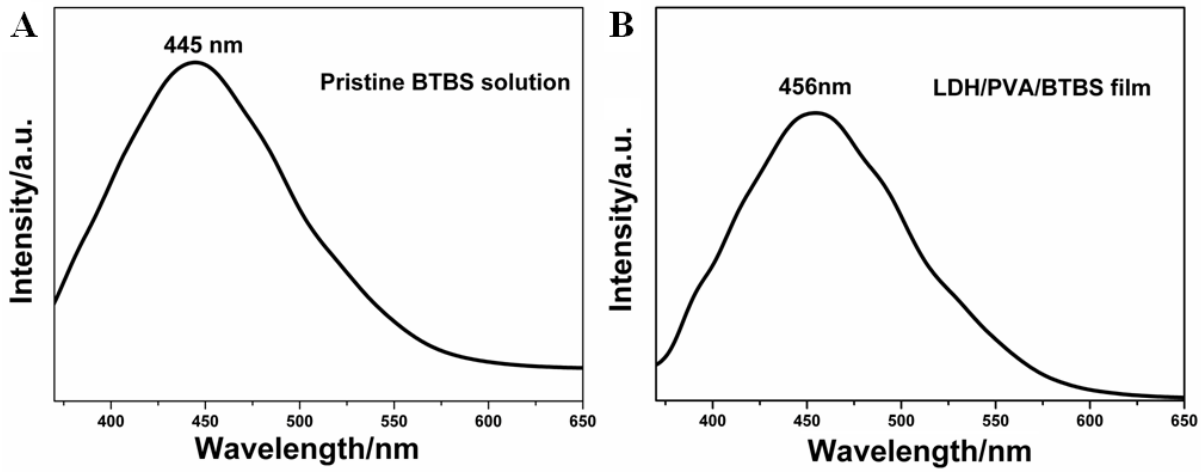

Figure S3. The fluorescence spectra of (A) pristine BTBS solution and (B) LDH/PVA/BTBS film prepared by solvent evaporation method.

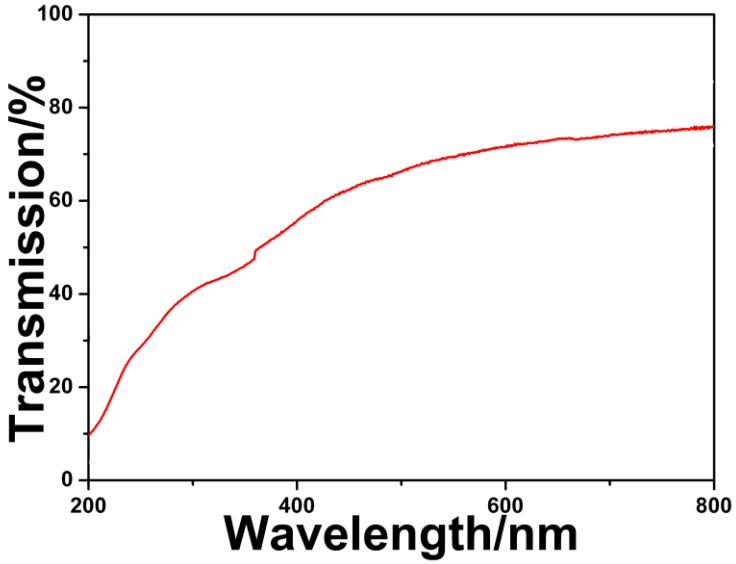

Figure S4. UV-vis transmittance spectrum of the $(LDH/PVA/LDH/BTBS)_{300}$ film.

Table S1. The compositions of $(LDH/PVA/LDH/BTBS)_{300}$ films obtained by using LDH suspensions with various concentrations (0.10 wt.%, 0.30 wt.% and 0.45 wt.%, respectively)

Sample	LDH (wt.%)	PVA (wt.%)	BTBS (wt.%)
b-$(LDH/PVA/LDH/BTBS)_{300}$ film	5.30	92.75	1.95
c-$(LDH/PVA/LDH/BTBS)_{300}$ film	7.47	90.56	1.97
d-$(LDH/PVA/LDH/BTBS)_{300}$ film	10.14	87.82	2.04

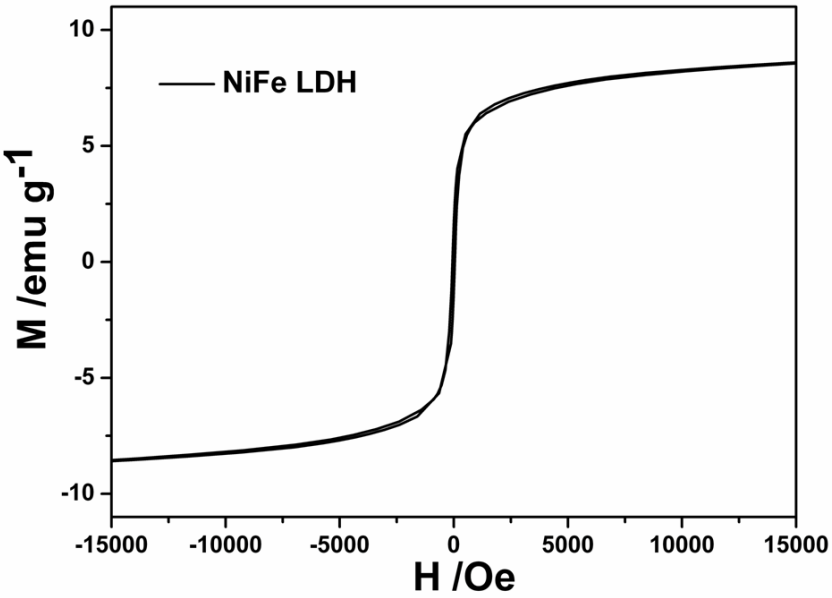

Figure S5. Room temperature (300 K) hysteresis loops for NiFe-LDH powder.

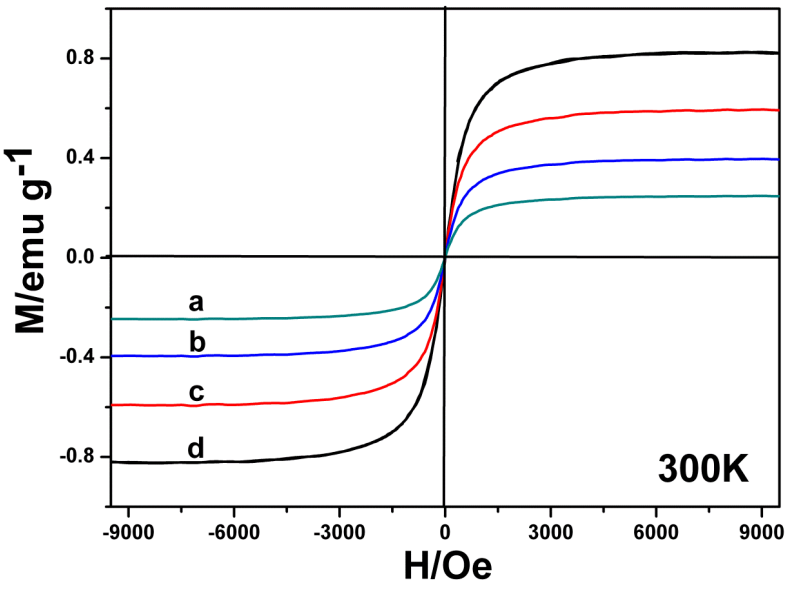

Figure S6. (A) Room temperature (300 K) hysteresis loops for (a) LDH/PVA/BTBS film with W_L =5.30% and $(LDH/PVA/LDH/BTBS)_{300}$ films with various W_L values (b: 5.30%; c: 7.47% and d: 10.14%).

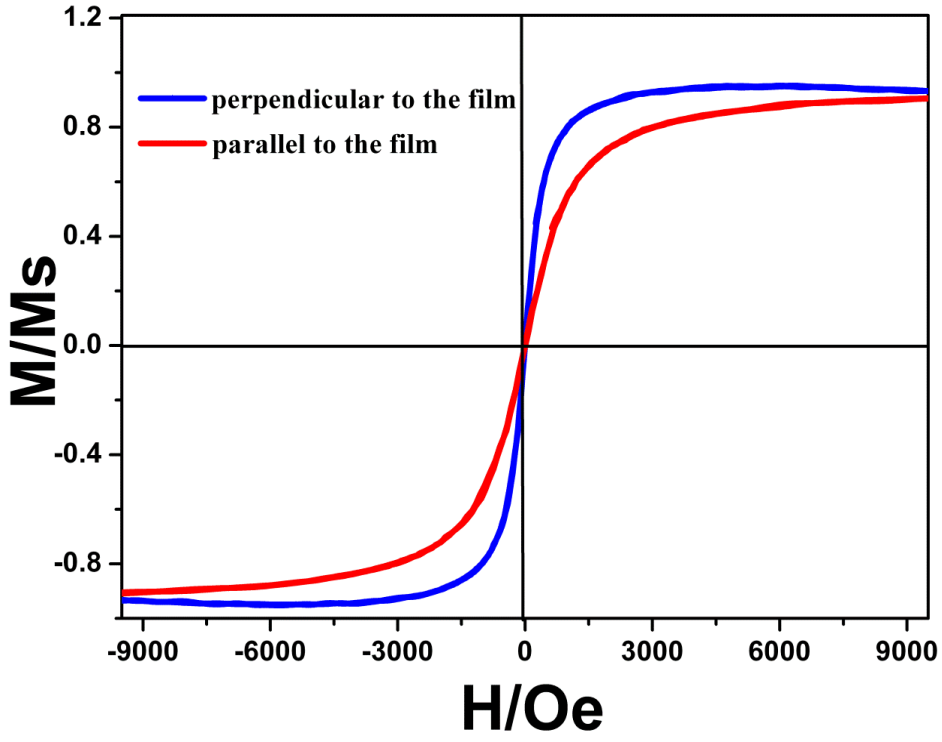

Figure S7. Room temperature (300 K) hysteresis loops at both orientations (magnetization values were normalized based on the corresponding saturation ones) for the $(LDH/PVA/LDH/BTBS)_{300}$ film.

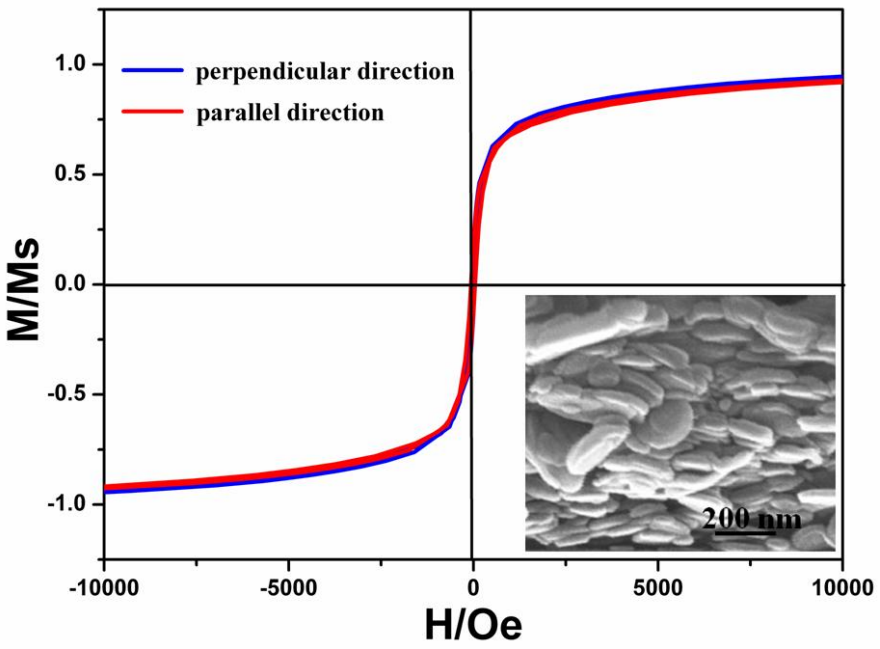

Figure S8. Room temperature (300 K) hysteresis loops at both orientations (magnetization values were normalized based on the corresponding saturation ones) for the disordered LDH tablet prepared by squash technique.

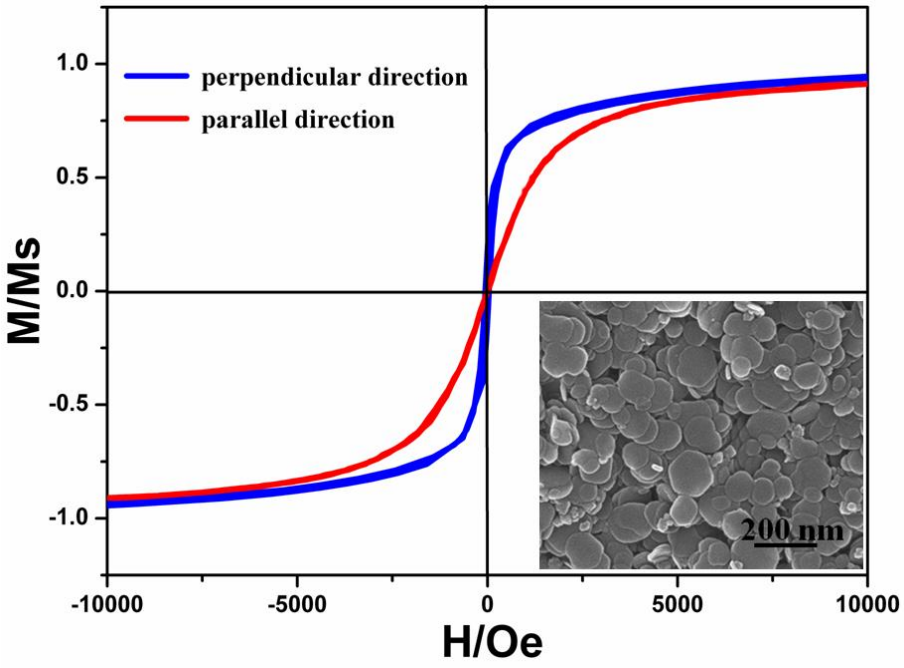

Figure S9. Room temperature (300 K) hysteresis loops at both orientations (magnetization values were normalized based on the corresponding saturation ones) for the oriented LDH film obtained by spin-coating technique.

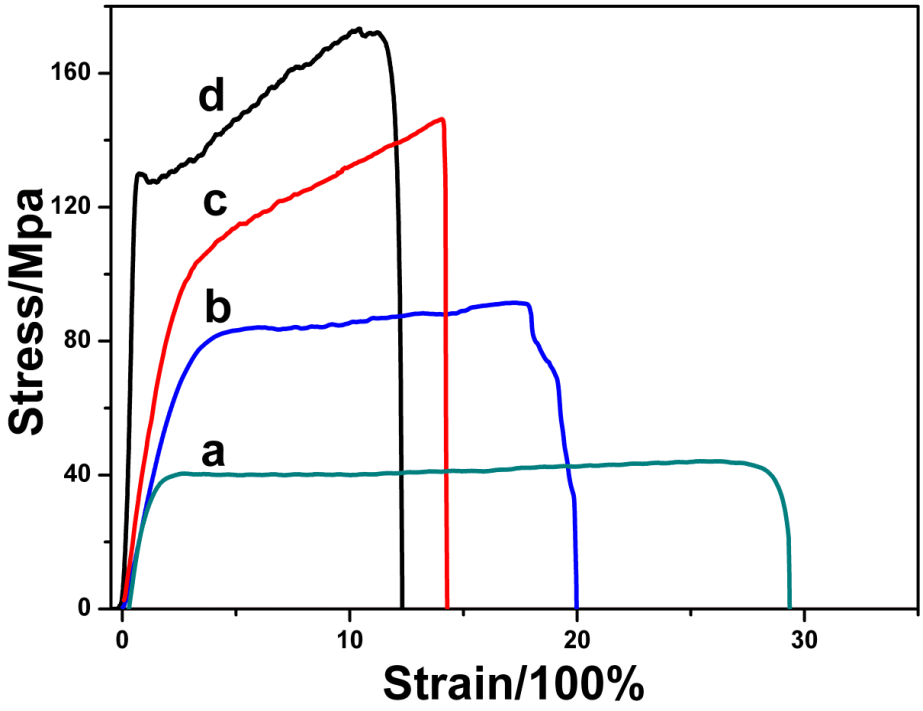

Figure S10. Stress–strain curves for (a) the disordered LDH/PVA/BTBS film with W_L=5.30% and the ordered $(LDH/PVA/LDH/BTBS)_{300}$ films with various W_L (b: 5.30%; c: 7.47% and d: 10.14%).

Tensile strength tests were carried on the free-standing films. Compared with the LDH/PVA/BTBS film prepared by the solvent evaporation technology, the $(LDH/PVA/LDH/BTBS)_{300}$ film with the same W_L of LDH displays higher tensile stress (σ_c), indicating the ordered incorporation of LDH platelets into organic matrix is beneficial to enhance the mechanical strength of the polymer. Moreover, the σ_c increased from ~63 MPa to ~128 MPa as W_L increased from 5.30% to 10.14%. In addition, all the $(LDH/PVA/LDH/BTBS)_{300}$ films with different W_L values exhibit good toughness (elongation at break > 10%). The results indicate the free-standing magnetic and luminescent films display excellent mechanical property, which guarantees their practical applications.