

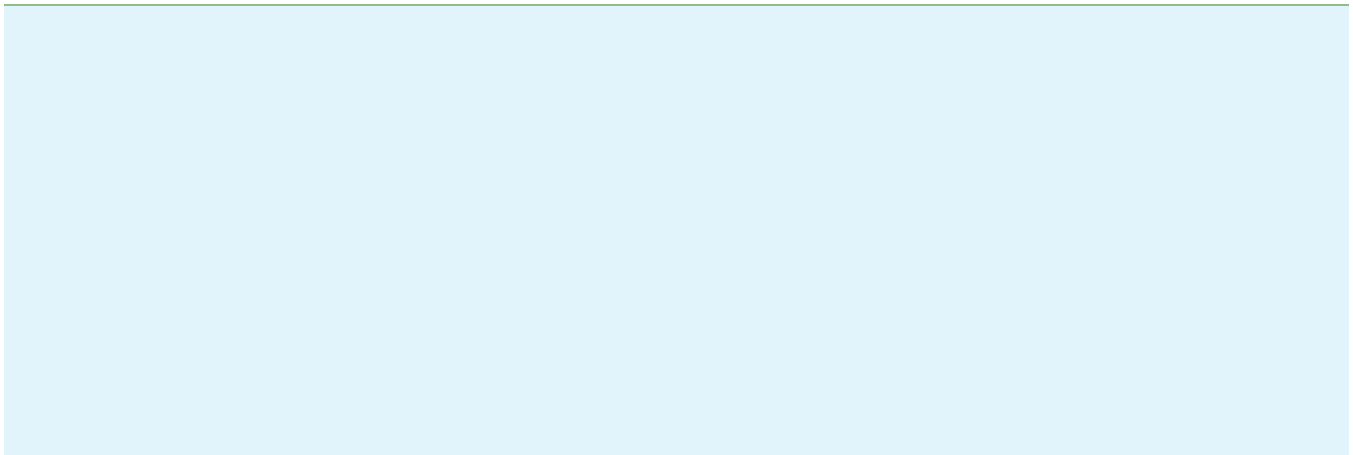
# Chirality-Enabled Liquid Crystalline Physical Gels with High Modulus but Low Driving Voltage

Huan Ruan,<sup>†</sup> Guannan Chen,<sup>†</sup> Xiaoyu Zhao,<sup>†</sup> Yong Wang,<sup>†</sup> Yonggui Li,<sup>†</sup> Haiyan Peng,<sup>†</sup> Chuan-Liang Feng,<sup>†</sup> Xiaolin Xie,<sup>†</sup> and Ivan I. Smalyukh<sup>‡</sup>

<sup>†</sup>Key Lab for Material Chemistry of Energy Conversion and Storage, Ministry of Education, School of Chemistry and Chemical Engineering, Huazhong University of Science and Technology (HUST), Wuhan 430074, China

<sup>‡</sup>School of Materials Science and Engineering, Shanghai Jiaotong University, Shanghai 200240, China

<sup>§</sup>Department of Physics and Materials S(of)-334.5(Physics)-330.2(a34.5(Sc1.08 .234als)-3s.ram,28.8(E5iversity)-330.36)-334.5





## 2.7. Circular Dichroism.

racemate. Only a suspension is obtained with the racemate. The result indicates the importance of chirality to enable a remarkable gelation capability as reported previously. Notably, it is a different story in hydrogels. The same racemate composed of 1,4-benzenedicarboxamide phenylalanine derivatives is able to form hydrogels. It is easy to understand that, in a hydrogel, both water and gelators participate in the physical network via intermolecular hydrogen-bonding. Neither LPF nor DPF generates hydrogen bonding with the hydrophobic 5CB.

3.2. Chirality of LPF and DPF Gels To get a deeper understanding on the chirality of LC gels, CD characterization was conducted. As displayed in Figure 2, both LPF and DPF dissolved in ethanol exhibit clear CD signals, indicating remarkable chirality. The LPF molecules show positive peak absorption at 219 nm, whereas negative peak absorption at 243 nm. By contrast, the DPF molecules show similar peak absorptions at the same wavelengths, but in opposite directions. The negative and positive Cotton effects for LPF and DPF, respectively, are supposed to be induced by the stacking of phenyl chromophores. Interestingly, a red shift of 100 nm on the peak absorptions is noted when LC gels are formed.







(27) Peng, H.; Chen, G.; Ni, M.; Yan, Y.; Zhuang, J.; Roy, V. A. L.; Li, R. K. Y.; Xie, X. Classical Photopolymerization Kinetics, Exceptional Gelation, and Improved Diffraction Efficiency and Driving Voltage in Scaffolding Morphological H-PDLCs Afforded Using a Photoinitiator Polym. Chem. 2015, 6, 825-8269.

(28) Zhao, Y.; Tong, X. Light-Induced Reorganization in Self-Assembled Liquid Crystal Gels: Electrically Switchable Diffraction Gratings Adv. Mater. 2003, 15, 1435-1435.

(29) Zhao, D.; Ouyang, D.; Jiang, M.; Liao, Y.; Peng, H.; Xie, X. Photomodulated Electro-Optical Response in Self-Supporting Liquid Crystalline Physical Gels Langmuir 2018, 34, 7515-7526.

(30) Moriyama, M.; Mizoshita, N.; Yokota, T.; Kishimoto, K.; Kato, T. Photoresponsive Anisotropic Soft Solids: Liquid-Crystalline Physical Gels Based on a Chiral Photochromic Gel Mater. 2003, 15, 1335-1338.