

光電、能源與生醫物理實驗室

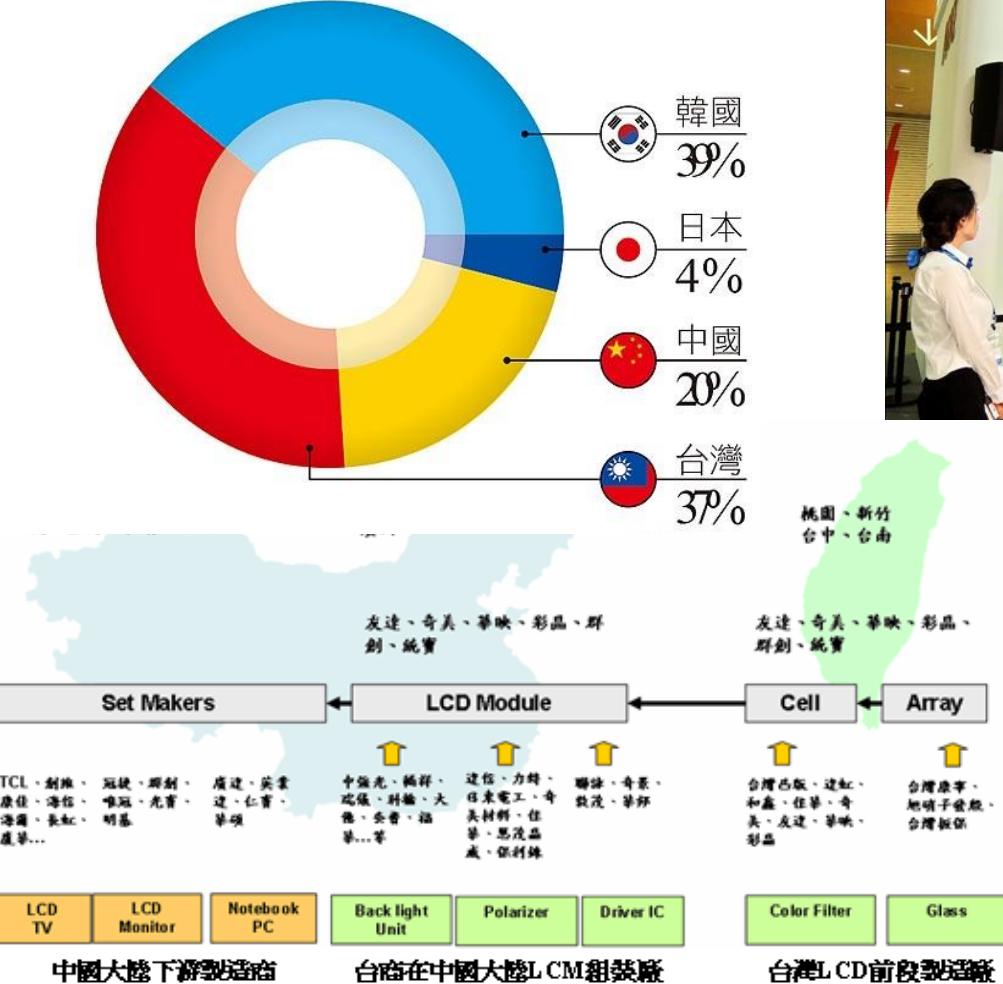
Optoelectronics & Medical Physics and Biomedical Engineering Lab

實驗室主持人：趙治宇 教授

Liquid Crystal Display

► 各國面板廠市佔率

資料來源：WitsView





- Conformable display
- Display of clothing
- Wrist display



Microdisplay Applications



節能玻璃



SUNSET VIEW FROM THE MAIN ENTRY ON SONG YONG ROAD
VINEGAR CALLAGHAN ARCHITECTURE
NEW MILLENIUM CONDOMINIUM, XINYI DISTRICT, TAIPEI CITY, TAIWAN 110
DNA
BALCONY GARDEN TOWERS



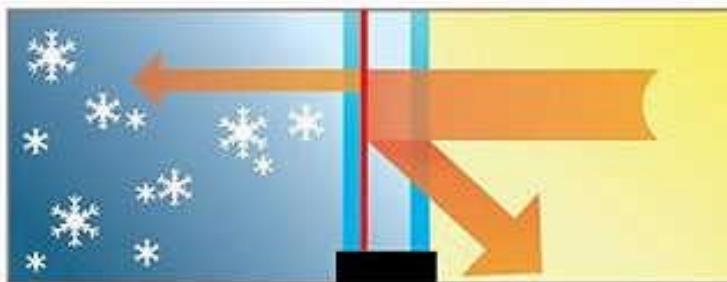
LED vs. Smart Windows

▶ LED

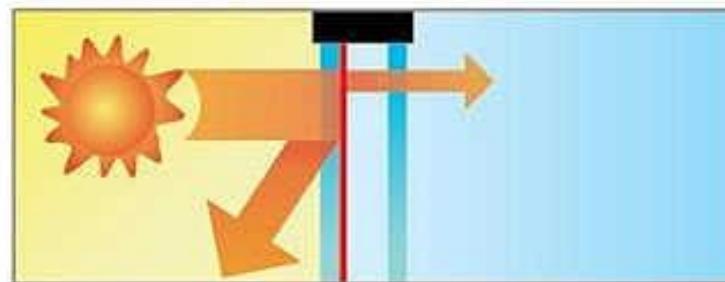
目前美国家庭之各類燈具的照明用電佔總體用電約26%，若全面都改採用LED燈具約可減少15%用電量。但LED燈具之價格仍然昂貴，對消費者而言不見得比較省錢。

▶ Smart Windows

節能玻璃可遮蔽辦公大樓至少15%的熱量來源，預期可省去中央空調約30%耗電。節能玻璃發展空間仍相當大，配合重視能源議題的趨勢，後市相當看漲！

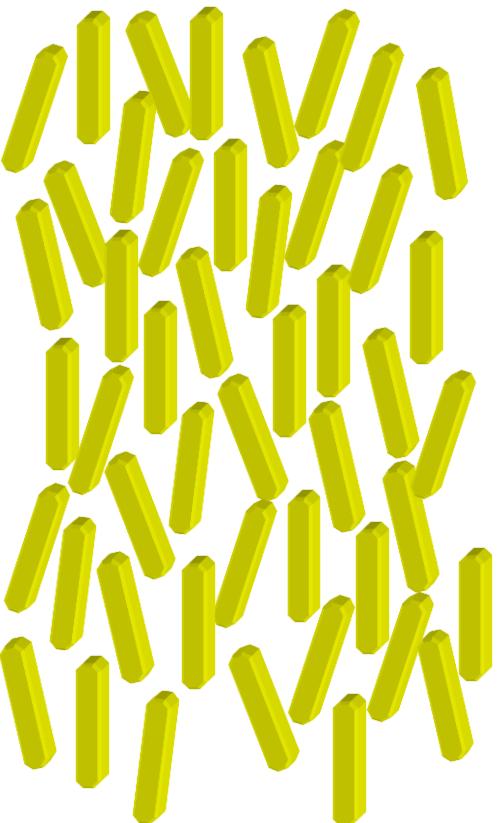


冬季：



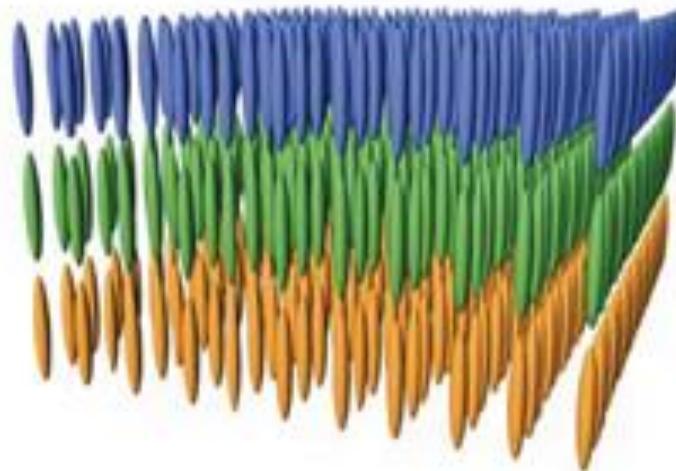
夏季：

Liquid Crystal (LC)

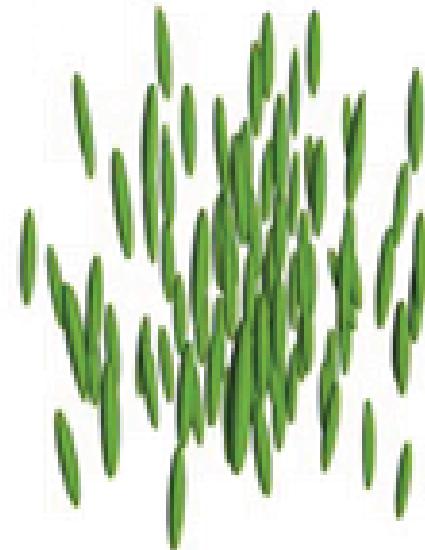


a liquid crystal may flow like a liquid, but its molecules may be oriented in a crystal-like way.

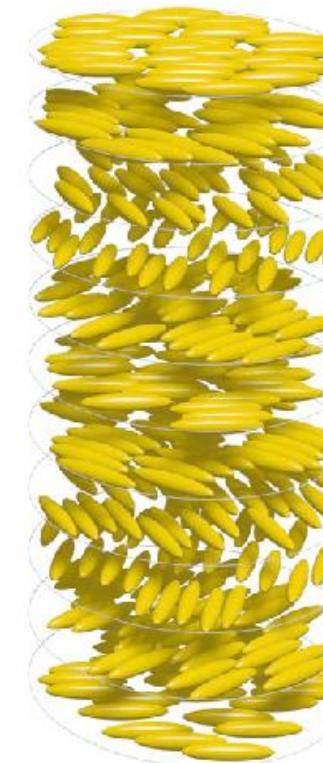
LC phases



Smectic

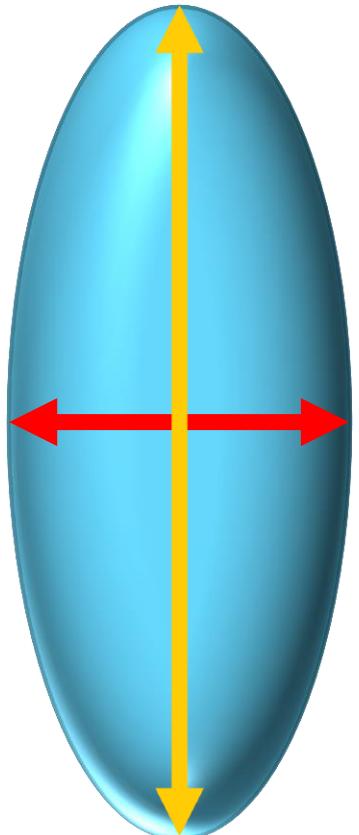


Nematic



Cholesteric

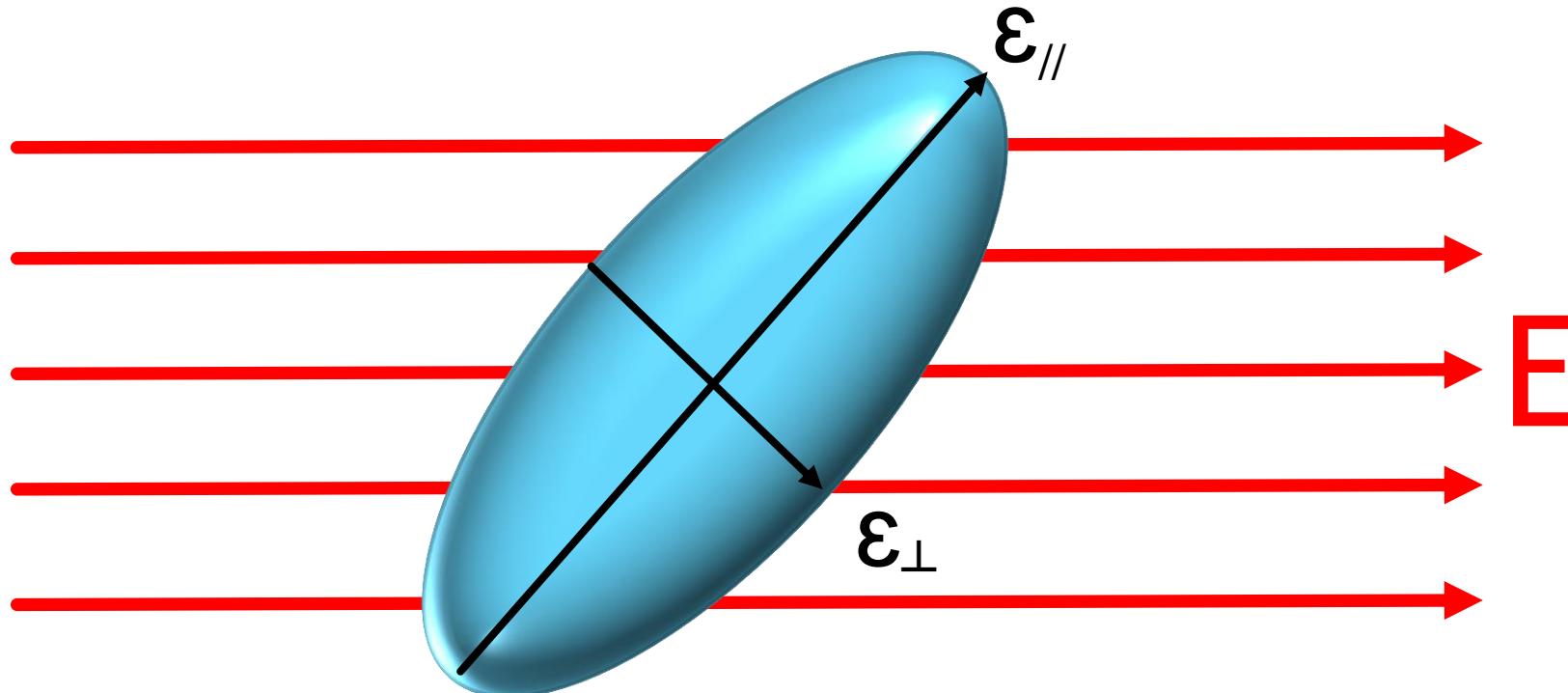
Optical anisotropy (Birefringence)



Short axis: ordinary index of refraction (n_o)

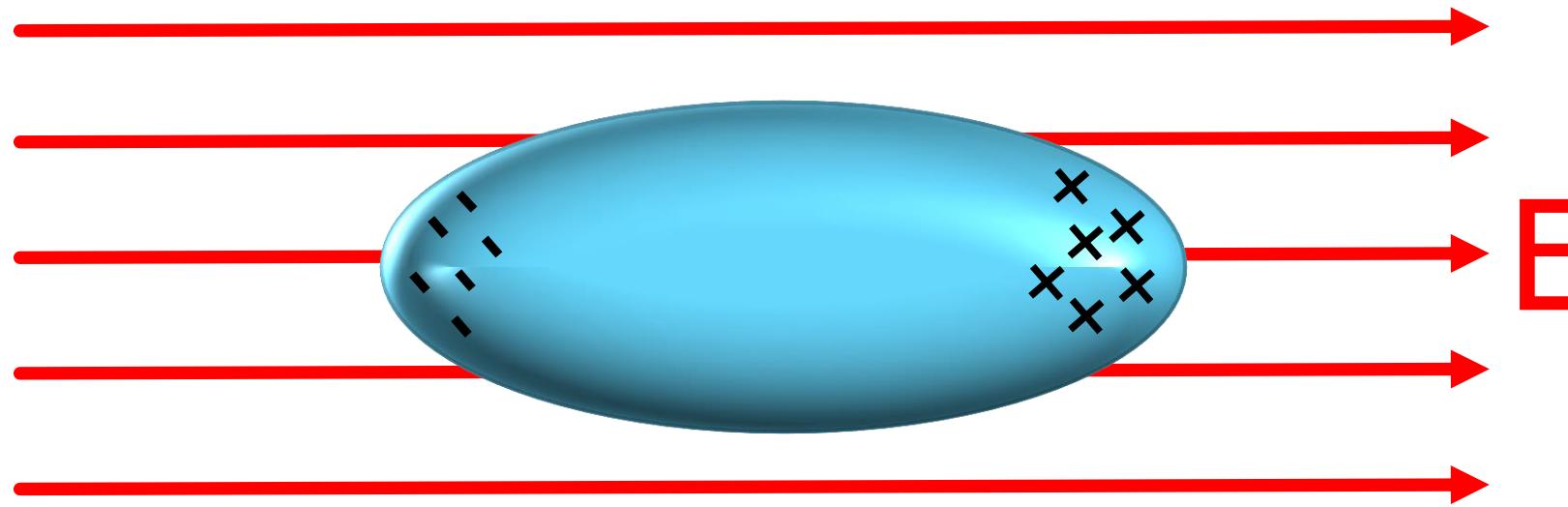
Long axis: extraordinary index of refraction (n_e)

Dielectric anisotropy

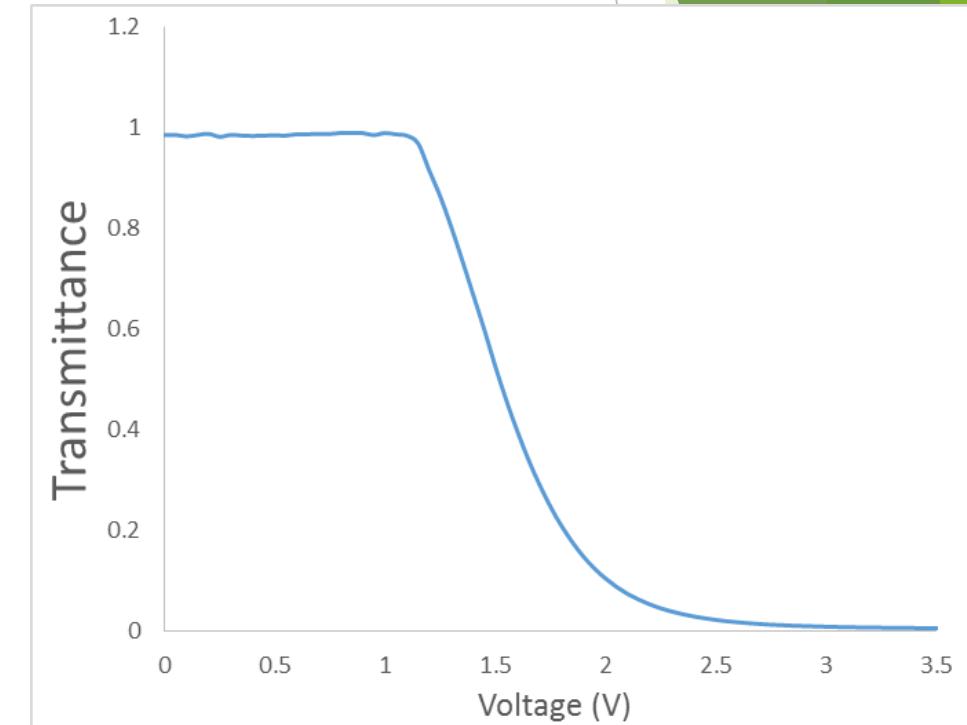
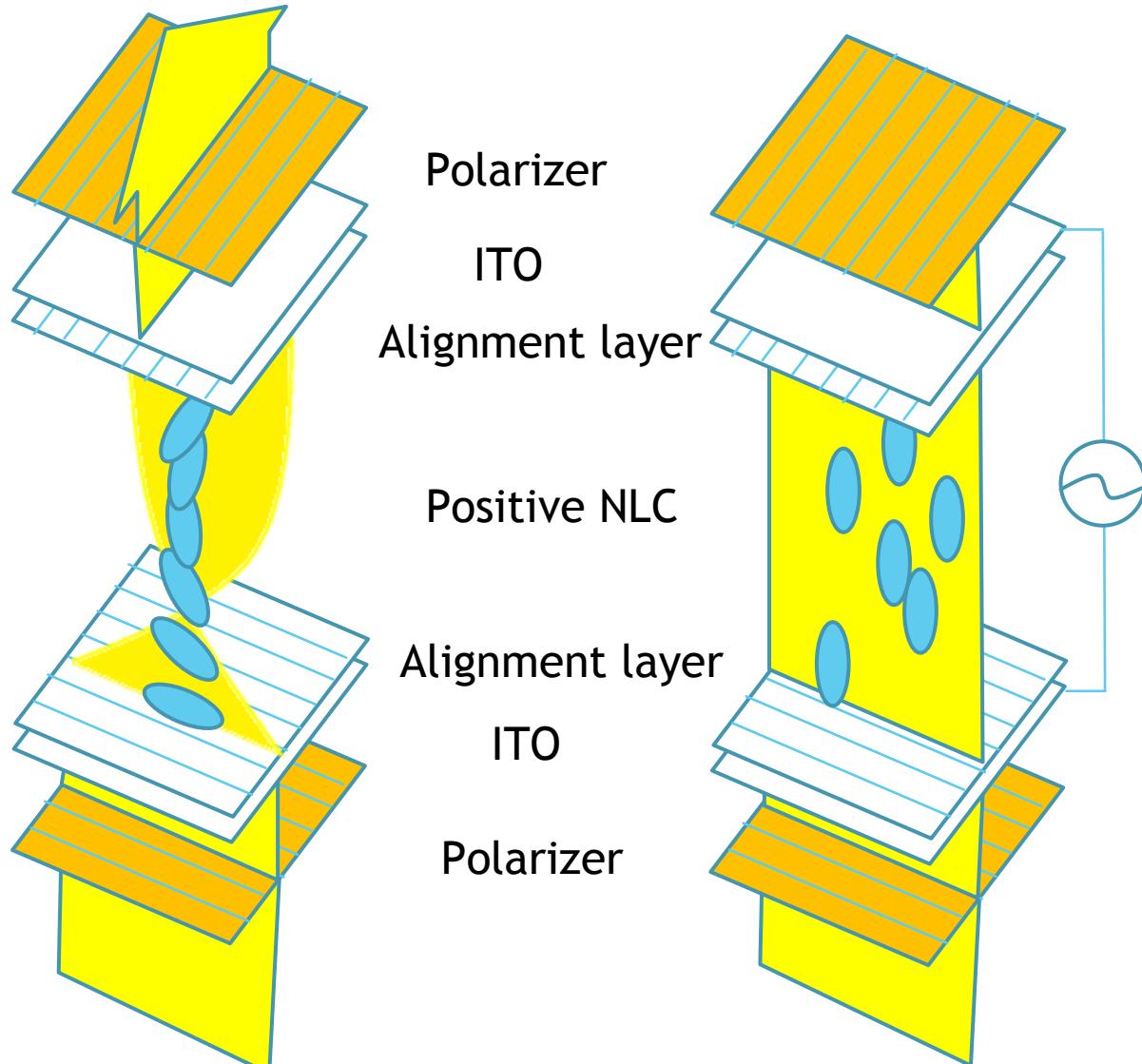


Dielectric anisotropy

If $\epsilon_{\parallel} - \epsilon_{\perp} > 0 \rightarrow$ positive LC



Twisted Nematic LC Mode

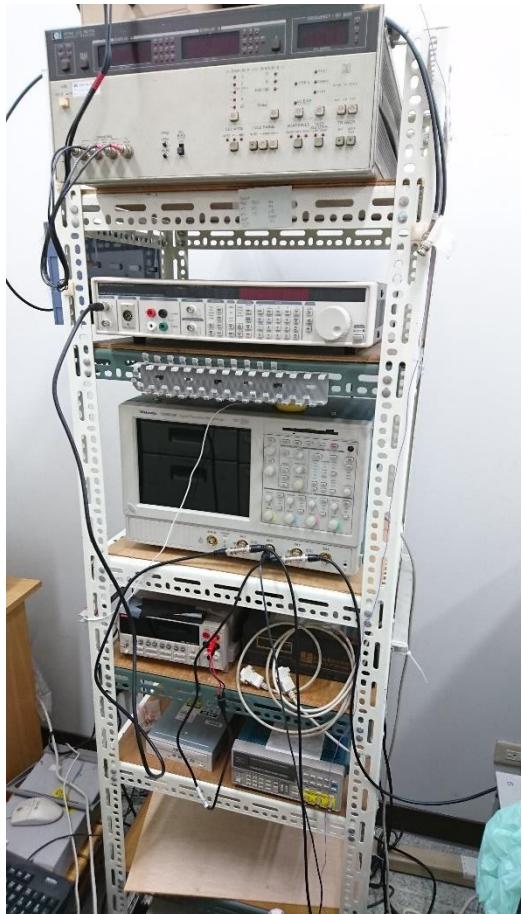
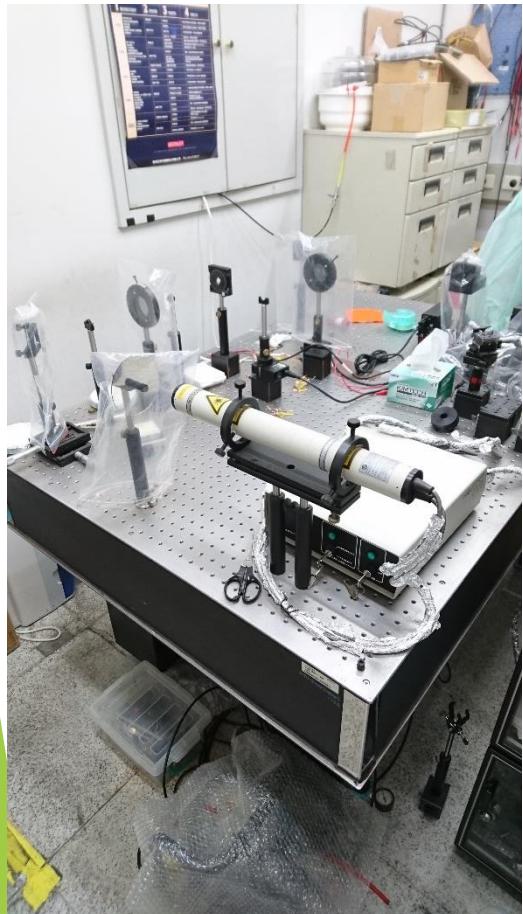


手套箱



- ▶ 低濕度(水氣含量<2%)
- ▶ 低含氧量(氧氣濃度<1ppm)
- ▶ 主要進行有機太陽能電池元件製作，
避免實驗過程材料氧化

光學量測桌



- 備有**632nm**雷射，偏振片及衰減片等
- 可連接電表、示波器、函數產生器等測量儀器
- 主要進行液晶光電元件之光電特性量測

奈米壓印機

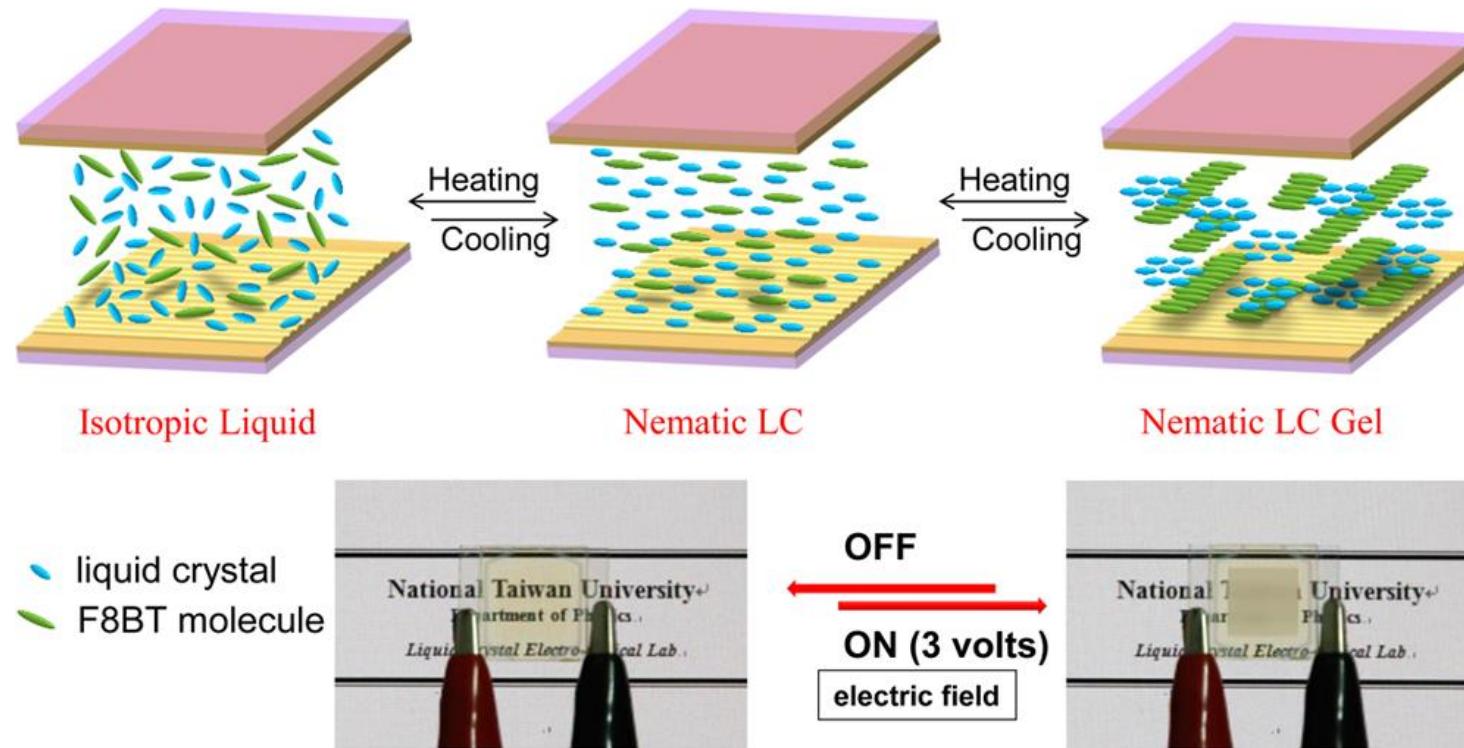


- 在可抽真空的腔體內製備奈米等級的結構



Supramolecular Liquid-Crystal Gels Formed by Polyfluorene-Based π -Conjugated Polymer for Switchable Anisotropic Scattering Device¹

Jun-Wei Chen, Chiu-Chang Huang, and Chih-Yu Chao*

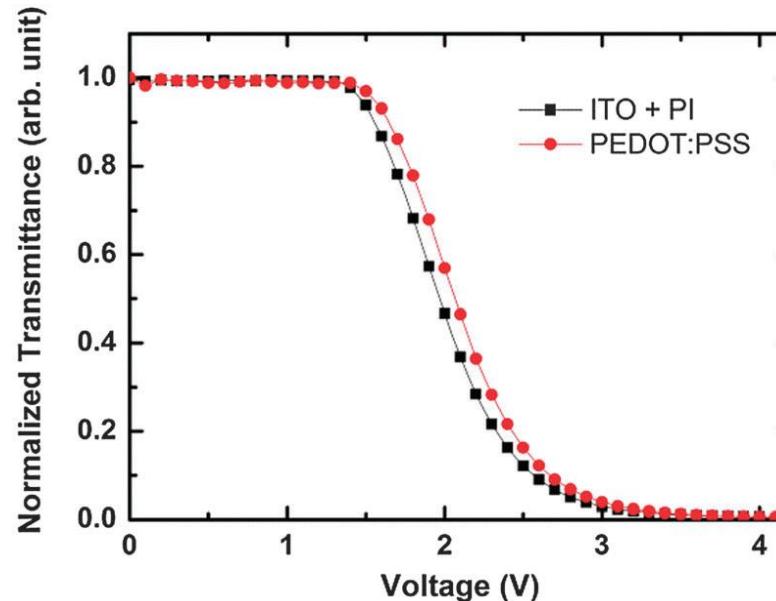
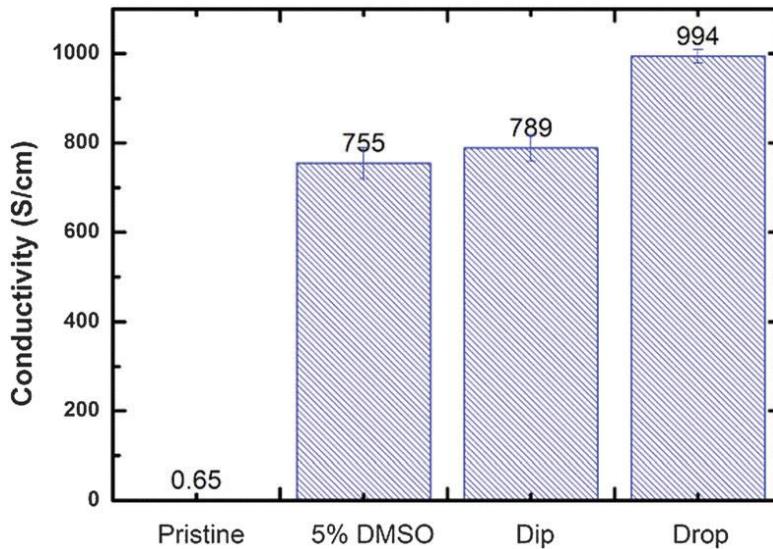




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3, 3760

Highly conductive PEDOT:PSS films by post-treatment with dimethyl sulfoxide for ITO-free liquid crystal display

Tsu-Ruey Chou,^a Szu-Hua Chen,^a Yen-Te Chiang,^b Yi-Ting Lin^a and
Chih-Yu Chao^{*abc}

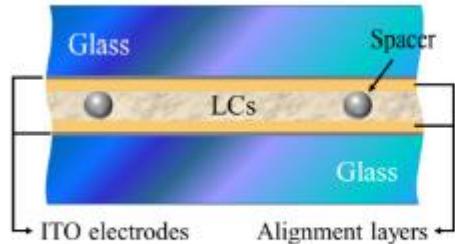


Liquid-crystal-modulated correlated color temperature tunable light-emitting diode with highly accurate regulation

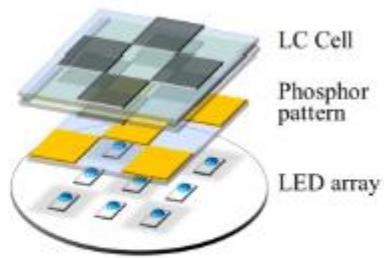
Chiu-Chang Huang, Yu-Yi Kuo, Szu-Hua Chen, Wei-Ting Chen, and Chih-Yu Chao^{*}

Received 29 Oct 2014; revised 12 Jan 2015; accepted 21 Jan 2015; published 30 Jan 2015

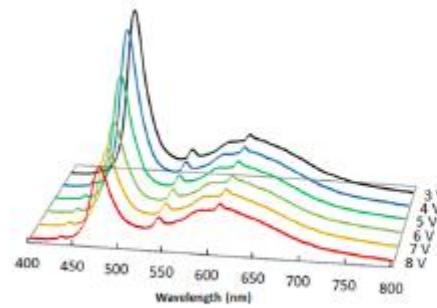
9 Feb 2015 | Vol. 23, No. 3 | DOI:10.1364/OE.23.00A149 | OPTICS EXPRESS A149



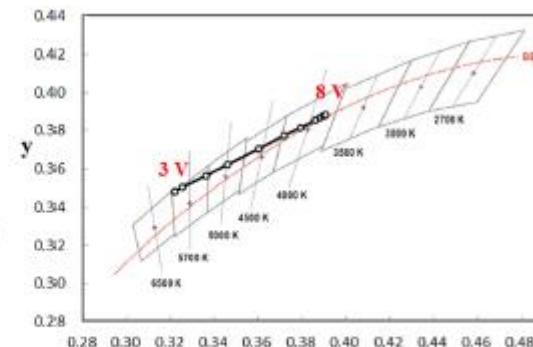
(a)



(b)



(a)



(b)

Effects of Low Viscosity Liquid on the Electro-Optical Properties of Inverse Twisted Nematic Liquid Crystal Display

Yen-Te Chiang, Tsu-Ruey Chou, Szu-Hua Chen, and Chih-Yu Chao

