

Photonic band gap tuning in chiral nematic LCs

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The Concept

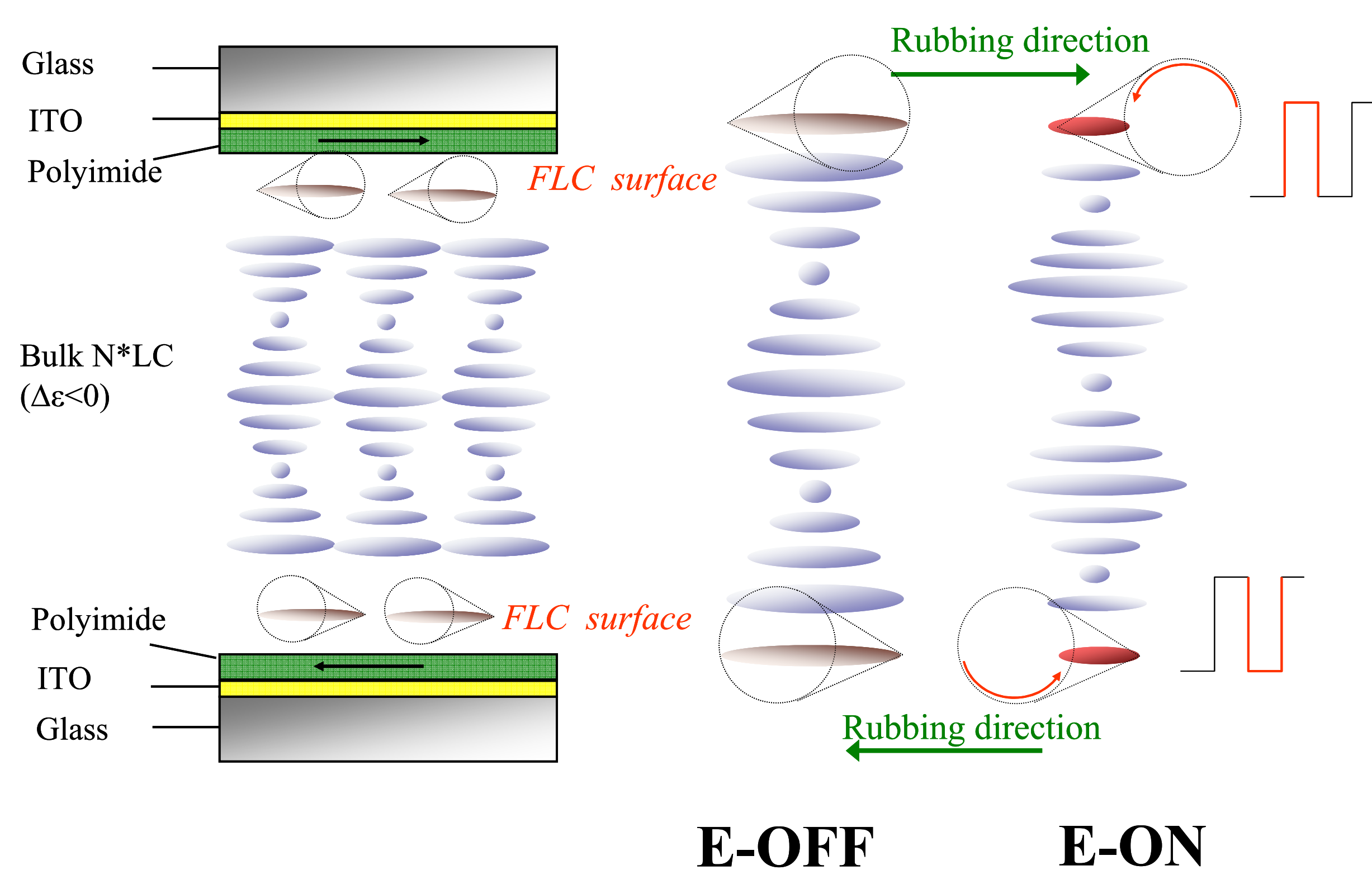


Fig.1. Schematic of the cell structure and the wavelength tuning mechanism using electrically commanded surface of an FLC

The Command Surfaces

- Continuous gold stone mode switching of a ferroelectric liquid crystal (FLC).
- 100nm thick coated FLC layers at the glass substrates.
- FLC layers respond to electric fields resulting in an in-plane rotation.

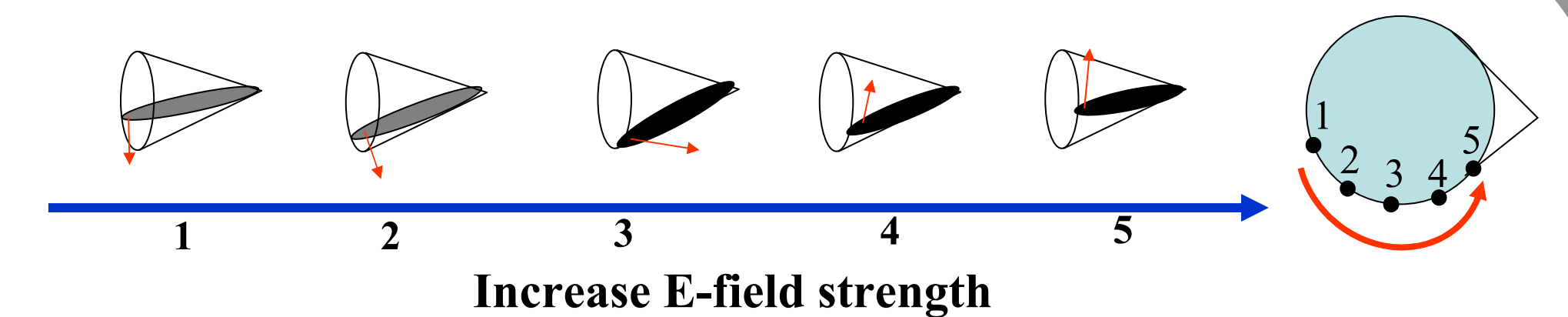


Fig.2. Continuous gold stone mode switching of the FLC material.

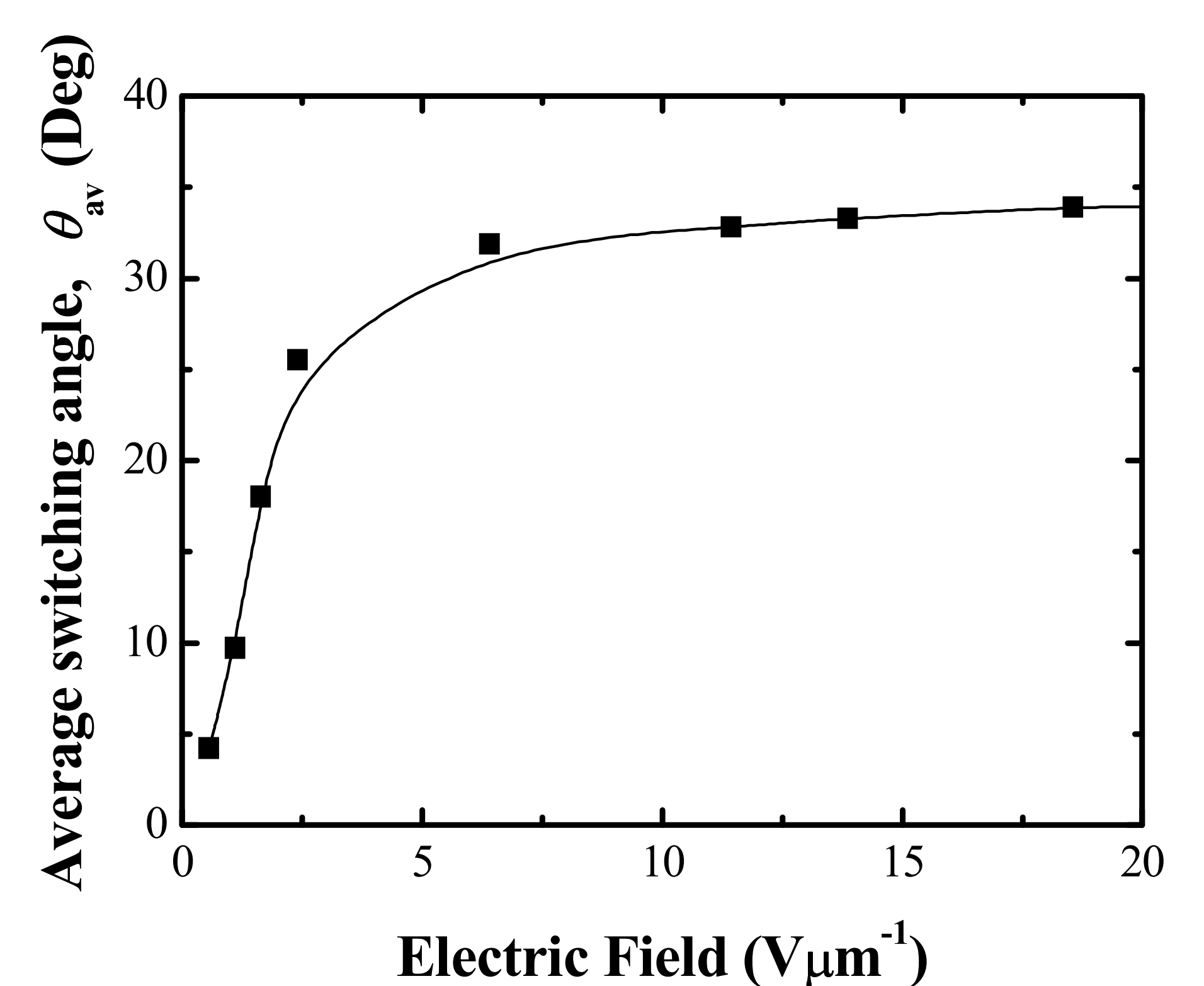
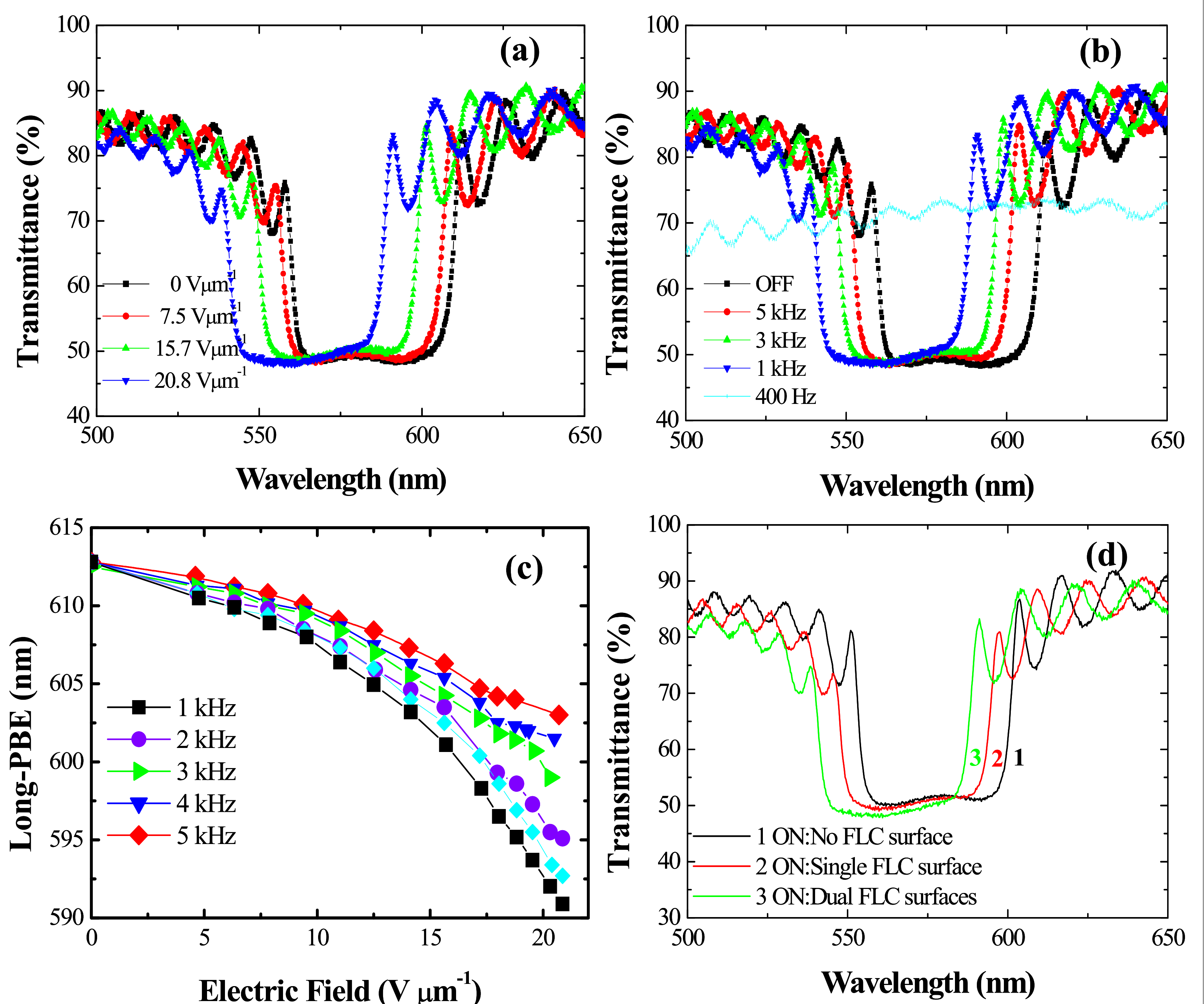


Fig.3. (Above) Average switching angle as a function of electric field strength.



- Passive switching mechanism of the chiral nematic liquid crystal (N*LC).
- Rotation of molecules at the surface generate a pitch contraction of the helix.

Results – Bandgap tuning

- Continuous control of the PBG due to the in-plane rotation of the command surfaces.
- Fine tuning using both frequency and electric field strength variation.

Fig.4. (Right) Tuning results of the photonic band gap (PBG) using electrically commanded FLC surfaces.

- The PBG as a function of electric field strength at a constant frequency of 1 kHz;
- The PBG as a function of frequency at a constant electric field amplitude of 20.8 V μm⁻¹ at 25°C;
- The long-photonic band edge (λ₁) as a function of electric field strength at different frequencies;
- Comparison of the shift of the PBG for no, single, and dual command surfaces with a constant electric field of 20.8 V μm⁻¹ at 1 kHz.

Further reading: S.S. Choi, S. M. Morris, W.T.S. Huck, H.J. Coles, Appl. Phys. Lett, **91**, pp.231110(1)-231110(3), (2007).
L. Komitov, B. Helge, J. Felix, A. Matharu, Appl. Phys. Lett. **86**, 023502 (2005)