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Coherent Optical Sources using Micromolecular Ordered Structures

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Characteristics of band-edge liquid crystal lasers

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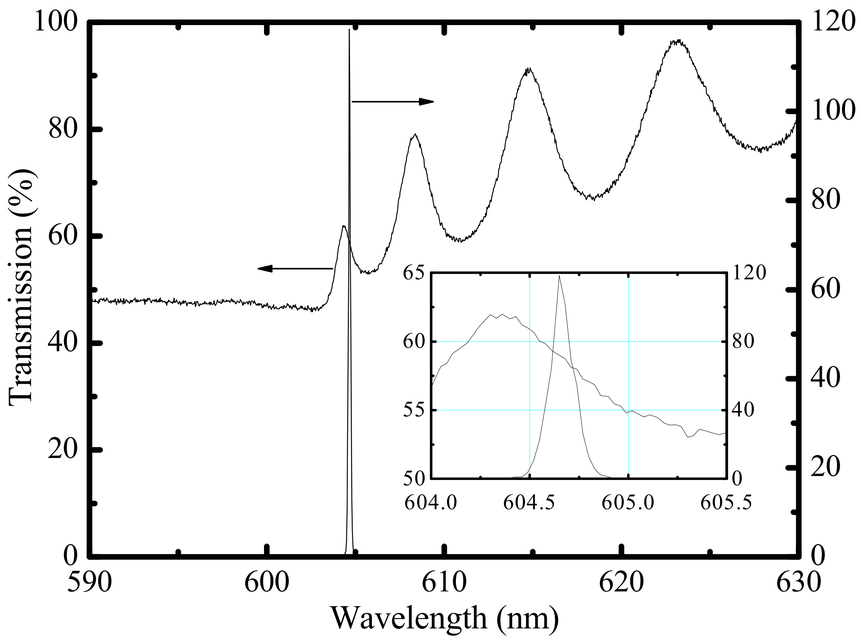
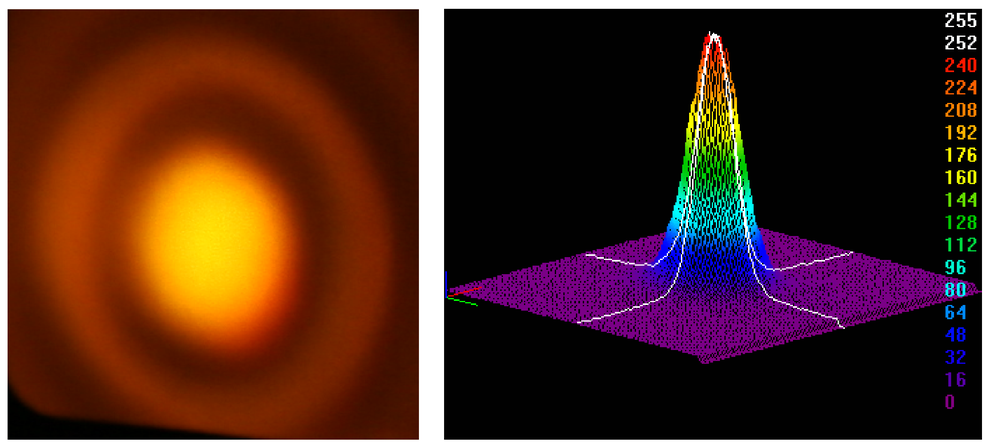
Lasing at the band-edge



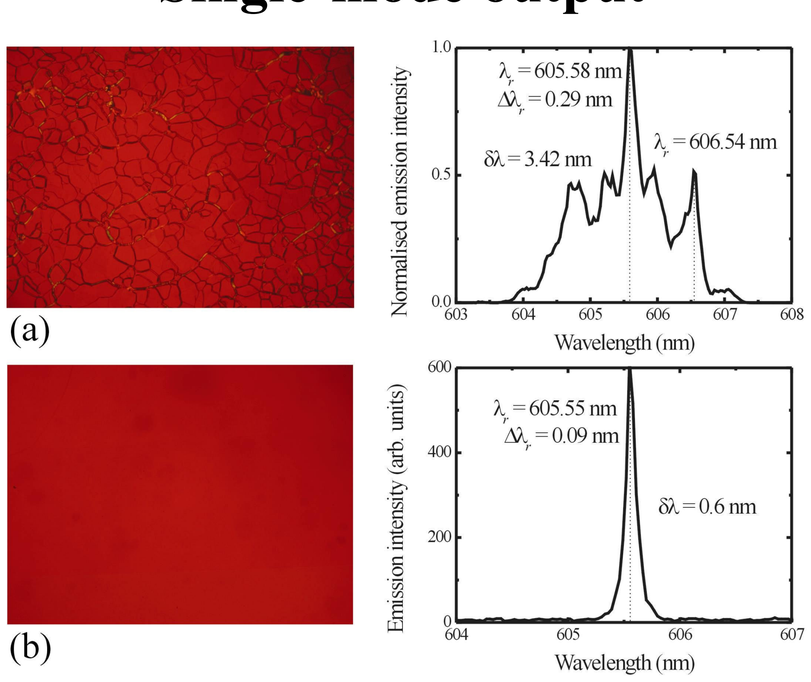
(**Left**) White light transmission spectrum, showing part of the photonic band gap and the long-wavelength band-edge (primary *y*-axis). The laser emission spectrum for a chiral nematic band-edge laser is shown on the secondary *y*-axis.

Output Profile



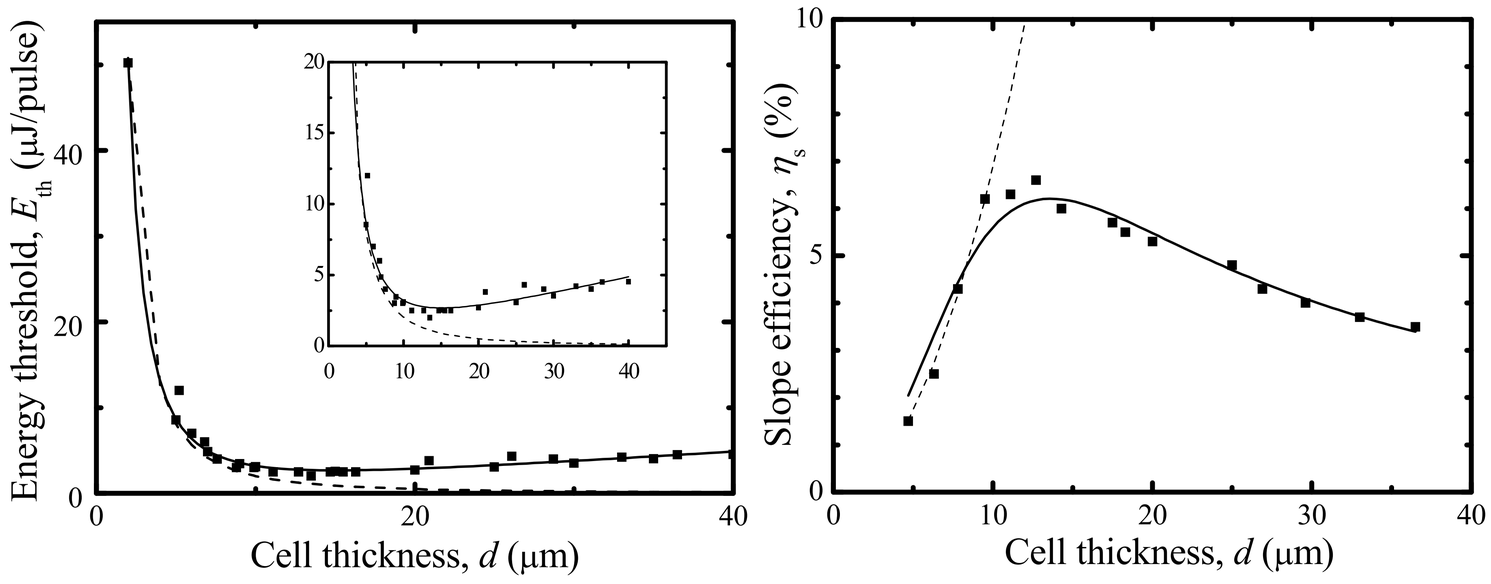
(**Above**) Photograph of the laser spot at the far-field and a three-dimensional plot of the spatial distribution of the energy, showing a near-Gaussian profile.

Single-mode output



(**Above**) Sample textures and corresponding laser spectra for (a) polydomain sample, and (b) monodomain sample.

Cavity length dependence

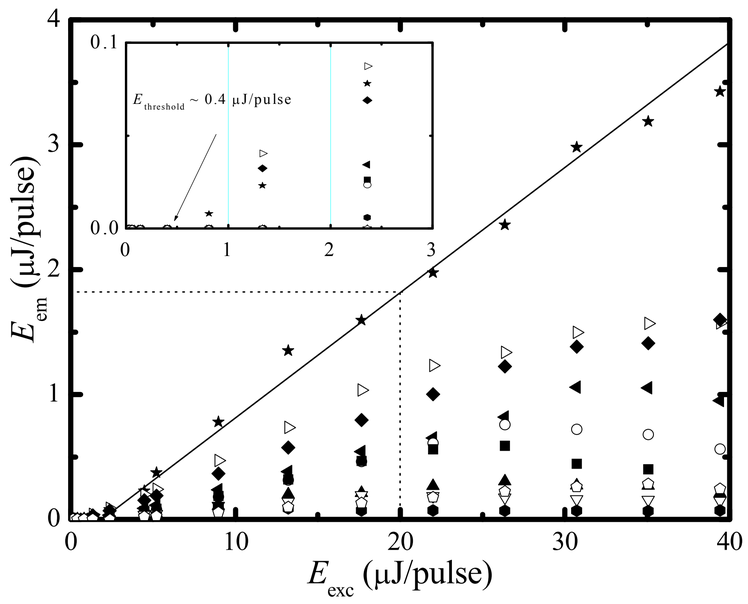


(**Above**) Excitation threshold energy (left) and slope efficiency (right) as a function of cell thickness for a chiral nematic band-edge laser.

Improving the feedback structure

(**Right**) The input-output characteristics for the ten different photonic band edge lasers. The excitation source is a Nd:YAG laser (λ_{exc} = 532 nm). The emission energy of the lasers, E_{em}, has been multiplied by factor of two to take into account the emission in the backwards direction. The key for the figure is as follows:

★ FF080CB, ▷ BL037, ◆ E49, ◂ BL093, ○ 60CB,
■ 50CB, ▲ 70CB, ▽ E7, ● FF090CB, ⬠ BL109



Further reading: *A.D. Ford, S.M. Morris, M.N. Pivnenko, C. Gillespie, H.J. Coles*, Phys. Rev. E, **75**, 051703, (2007).
S.M. Morris, A.D. Ford, M.N. Pivnenko, O. Hadeler, H.J. Coles, Phys. Rev. E, **74**, 061709, (2006).

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