

THE UNIVERSITY of EDINBURGH

Edinburgh Research Explorer

Chiral nematic droplets for lasing: Microfluidic generation and manipulation

Citation for published version:

Normand, M, Englezopoulos, K, Pawsey, A & Hands, P 2017, 'Chiral nematic droplets for lasing: Microfluidic generation and manipulation', Joint Conference of the German & British Liquid Crystal Societies, Würzburg, Germany, 3/04/17 - 5/04/17.

Link: Link to publication record in Edinburgh Research Explorer

General rights

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The University of Édinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.



Chiral Nematic Droplets for Lasing: Microfluidic Generation and Manipulation

Margaret C. Normand, Konstantinos Englezopoulos, Anne C. Pawsey, Philip J.W. Hands*

Institute of Integrated Micro & Nano Systems (IMNS), School of Engineering, University of Edinburgh, Alexander Crum Brown Road, EH9 3FF Edinburgh, UK **E-mail: philip.hands@ed.ac.uk*

Chiral nematic liquid crystals (LC) can be used to form high quality, tuneable resonant cavities suitable for photonic band-edge lasing. This has normally been achieved by promoting a standing helix molecular structure in a glass cell, or with dried emulsions.[1] However, recent research has shown that droplets of chiral nematic LC in an immiscible host solution can also be used; the helical structure forms radially resulting in a 'spherulite' texture and omnidirectional laser emission.[2][3]

There are several different techniques for fabricating droplets, from simple mixing of emulsions to drop-on-demand microfluidics. Not all are optimal for producing lasing droplets with consistent optical performance. We report upon the use of microfluidic channel junctions as a repeatable method of fabricating monodisperse droplets of dye-doped chiral nematic LC. We are able to study the optical properties of the droplets during formation, whist flowing in a microfluidic channel, and in storage chambers of various dimensions. We also demonstrate directional laser emission from confined, non-spherical, droplets. Our findings will be discussed in the context of enabling applications of LC laser droplets.

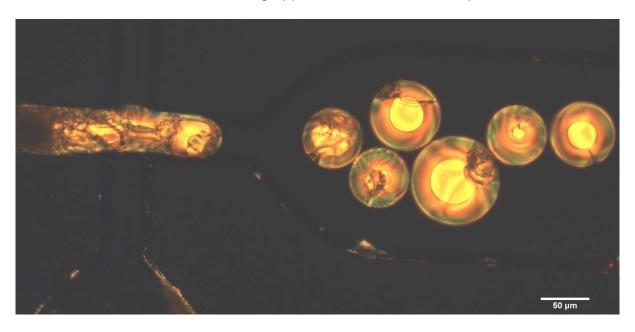


Figure 1 - Polarising optical microscopy of dye-doped chiral nematic LC droplets in a microfluidic channel.

References:

- [1] D. J. Gardiner, S. M. Morris, P. J. W. Hands, C. Mowatt, R. Rutledge, T. D. Wilkinson, H. J. Coles, Opt. Express, 2011, 19, 2432–2439
- [2] M. Humar, I. Musevic, Opt. Express, 2010, 18, 26995–27003
- [3] M. Humar, F. Araoka, H. Takezoe, I. Muševič, Opt. Express, 2016, 24, 19237.