

Intense light-matter interactions in photonic crystal and microstructured fibres

P. St.J. Russell

Max Planck Institute for the Science of Light

Guenther-Scharowsky Str. 1, 91058 Erlangen, Germany

E-mail: philip.russell@mpl.mpg.de

The well-controlled guided modes and long path-lengths offered by photonic crystal fibres (PCFs) permit remarkable enhancements (and in some cases reductions) in many kinds of light-matter interaction [1]. Recent examples include: the solid core PCFs widely used in generation of bright broad-band supercontinuum light [2,3]; twisted PCFs that support modes carrying orbital angular momentum [4]; effective light-driven optoacoustic devices that permit stable GHz mode-locking of fiber ring lasers [5]; bright deep and vacuum UV sources based on gas-filled hollow core PCF [6-8]; and nano-scale glass structures that self-pulsate optomechanically when pumped with only a few mW of continuous wave laser light [9]. After introducing PCF itself, I will discuss a selection of recent results in the talk.

References

1. P. St.J. Russell, "Photonic-crystal fibers," *J. Lightwave Tech.* **24**, 4729–4749 (2006).
2. J. M. Dudley, G. Genty, and S. Coen, "Supercontinuum generation in photonic crystal fiber," *Reviews of Modern Physics* **78**, 1135–1184 (2006).
3. X. Jiang, N. Y. Joly, M. A. Finger, F. Babic, G. K. L. Wong, J. C. Travers, and P. St.J. Russell, "Deep ultraviolet to mid infrared supercontinuum generated in solid-core ZBLAN photonic crystal fibre," *Nat. Phot.* **9**, 133–139 (2015).
4. X. M. Xi, G. K. L. Wong, M. H. Frosz, F. Babic, G. Ahmed, X. Jiang, T. G. Euser, and P. St.J. Russell, "Orbital-angular-momentum-preserving helical Bloch modes in twisted photonic crystal fiber," *Optica* **1**, 165–169 (2014).
5. M. Pang, X. Jiang, W. He, G. K. L. Wong, G. Onischukov, N. Y. Joly, G. Ahmed, C. R. Menyuk, and P. St.J. Russell, "Stable sub-picosecond soliton fiber laser passively mode-locked by GHz acoustic resonance in PCF core," *Optica* **2**, 339–342 (2014).
6. P. St.J. Russell, P. Hölzer, W. Chang, A. Abdolvand, and J. C. Travers, "Hollow-core photonic crystal fibres for gas-based nonlinear optics," *Nat. Phot.* **8**, 278–286 (2014).
7. F. Belli, A. Abdolvand, W. Chang, J. C. Travers, and P. St.J. Russell, "Vacuum-UV to IR supercontinuum in hydrogen-filled photonic crystal fiber," *Optica* **2**, 292–300 (2014).
8. F. Tani, F. Belli, A. Abdolvand, J. C. Travers, and P. St.J. Russell, "Generation of three-octave-spanning transient Raman comb in hydrogen-filled hollow-core PCF," *Opt. Lett.* **40**, 1026–1029 (2015).
9. A. Butsch, J. R. Koehler, R. E. Noskov, and P. St.J. Russell, "CW-pumped single-pass frequency comb generation by resonant optomechanical nonlinearity in dual-nanoweb fiber," *Optica* **1**, 158–164 (2014).