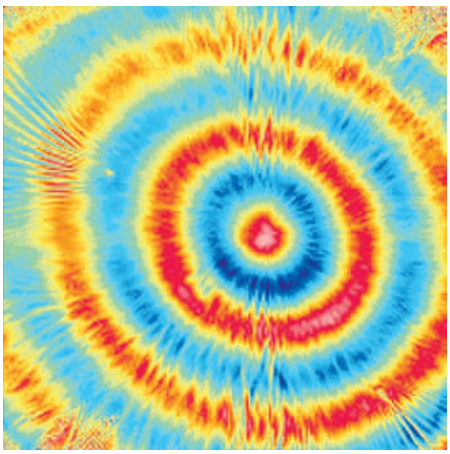
networks. By eliminating optical–electronic–optical conversions in conventional networks, transmission speeds can potentially be increased and power consumption decreased. Now Stefan Preußler and Thomas Schneider from Leipzig, Germany, have implemented the optical delay of a phase-modulated eight-bit signal at a bit rate of 1 Gbps, and achieved a storage time of 60 ns. The scheme utilizes a process known as quasi-light storage, which is based on the frequency sampling of the data packet spectrum and allows for the storage of data packets in optical fibres. Stimulated Brillouin scattering in a 20-km fibre delay line is used so that the spectrum of the signal can be multiplied by a frequency comb to facilitate quasi-light storage. The researchers say that a reduced Brillouin gain bandwidth and higher pump powers could be used to improve further the storage of data packets. *SA*

SPINTRONICS

Polariton spin transport

Phys. Rev. Lett. **109,** 036404 (2012)

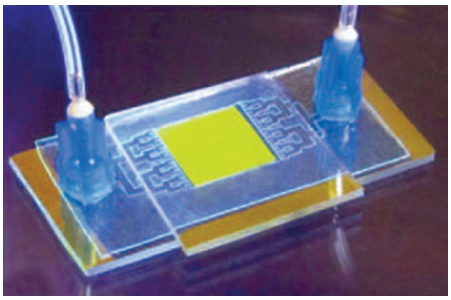


Elena Kammann and colleagues from the UK, Singapore, Greece and Russia have demonstrated that polariton spin can be transported over millimetre-scale distances (>300 μm) without significant loss of spin information. As the polaritons propagate, their spins precess around an effective magnetic field in the sample plane; the authors draw analogies to the spin Hall effect. In their studies, the team used an AlGaAs/GaAs microcavity to provide a Rabi splitting of 9 meV and a cavity photon lifetime of 9 ps. To excite the polaritons, a 5-μm laser spot was intensity modulated at 10 kHz and a duty cycle of only 5% was used to reduce heating. Emission from the cavity is separated spectrally from the excitation before imaging. The linear components of the Stokes vector were found to show a cartwheel pattern and the circular component revealed up to four revolutions of the pseudospin around the effective magnetic field within the polariton lifetime. The nonlinear nature of the effect was demonstrated by testing at different powers, revealing a threshold below which the pattern is lost and no spin pattern observed. *DP*

PHOTOELECTROCATALYSIS

Improved efficiency

Lab Chip http://dx.doi.org/10.1039/c2lc40428A (2012)



Ning Wang and co-workers from China and Switzerland have recently shown how to reduce one of the performance limitations of photoelectrocatalytic reactors: unwanted recombination of photoexcited electrons and holes. Previous work had shown that a carefully designed combination of optics and microfluidics can help overcome mass and photon transfer limits, by increasing surface-area-to-volume ratios and allowing direct delivery of light to reaction surfaces. However, these 'microreactors' still have a low photonic efficiency and one main reason is the recombination of photoexcited electrons and holes. To prevent this, Wang and colleagues introduce an external bias electric field that forces separation of the electrons and holes. Their microfluidic photoelectrocatalytic reactor (10 mm × 10 mm × 0.1 mm) is made from a blank indium tin oxide glass substrate, an epoxy spacer and a $BiVO_4$-coated indium tin oxide glass substrate illuminated by a blue light-emitting diode panel (10 mm × 10 mm). These reactors should be scalable, and the team hopes that they will be of interest for applications such as water and air purification, the photoreduction of CO_2 and heavy metal ions, and artificial photosynthesis. *DP*

OPTICAL TRAPPING

Mapping trapping potential

Appl. Opt. **51,** 5522–5526 (2012)

When using an optical trap, knowledge of how the radial optical trapping potential varies with distance can be useful in, for instance, studying the extension of a single DNA with a dual optical trap system or a colloidal particle pulled by a moving trap. Previous systems require either a variable flux control or an additional beam to determine this variation, but Ignacio Martínez and Dmitri Petrov from ICFO and ICREA in Spain have developed a simple method that can be used in existing optical trapping systems with minimal changes. Essentially the scheme makes use of an acousto-optical deflector, a device that can be used to generate multiple traps and to tune electronically the trap position and its intensity. The researchers created multiple traps by rapidly switching, on a timescale typically of the order of tens of milliseconds, a single optical beam between a number of optical focuses, by changing the frequency of acoustic waves propagating in the acousto-optical deflector. This time-sharing of the deflector permits the mapping of the trapping potential over a greater range of probe displacements through the independent control of the positions and stiffnesses of two optical traps. The team applied the scheme to particles 1 and 2 μm in diameter with a displacement range of ±4 μm, and the results were consistent with previous studies. *RW*

BIOPHOTONICS

Monitoring mucus flow

Biomed. Opt. Express **3,** 1978–1992 (2012)

Amy Oldenburg and colleagues from University of North Carolina at Chapel Hill in the United States have demonstrated that optical coherence tomography can be used to monitor the activity of cilia and mucus flow in the mammalian airway. Using an *in vitro* human airway model and *ex vivo* mouse tracheas, they have used cross-correlation measurements to quantify the flow of thick mucus directly. They also showed that optical coherence tomography with an axial resolution of ~3 μm can image the layer of fine, hair-like cilia (~7 μm in length) that line the airway and beat in a coordinated fashion to transport mucus. With the use of a sufficiently high frequency rate (>3.3 Hz) for variance contrast imaging, ciliary activity could be visualized underneath a thick and turbid mucus layer. The researchers predict that their methods will result in new applications for optical coherence tomography, which is already popular in studies of the retina. In particular, the scheme could be useful for examining changes that occur in the human respiratory system as a result of conditions such as cystic fibrosis and chronic obstructive pulmonary disease. *RW*

Written by Seiji Armstrong, David Pile, Rachel Won and Oliver Graydon.